THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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THE WEEK IN IRON CIRCLES.

General Features. Quietness and demoralization are prominent features of the iron market. The financial disturbances in London and New York have produced their natural effect in iron, as well as other circles, and for the time being there is almost a total lack of confidence on the part of consumers. Many large contracts for raw material, which were under contemplation late in October, have been either dropped or postponed, the result being a flat pig iron market, with sales nearly restricted to car loads. A few large buyers, however, have seized the opportunity to pick up job lots, and in certain cases to make running contracts. These, however, are the exception, most consumers preferring to take chances and wait till first of year to cover balance of season's needs. Many leading furnaces North and South have practically withdrawn from the market, being unwilling to sell at figures made by some of the smaller companies pressed for money. These latter have succeeded in breaking the markets assisted by the financial flurry, but the result has not been to force prominent standard brands to same level; instead a large number have decided to hold their unsold output indefinitely rather than sacrifice. The outlook is one of uncertainty, and seems likely to remain obscure until the monetary situation is on a more easy basis. The heavy consumption is likely, however, to prove a steadying influence. By common consent, at all the Central Western points, there has been practically no effort at business in crude iron the week past. Furnaces and their representatives have felt that no good can come of efforts to make sales, on account of the widespread feeling of uncertainty and apprehension. Leading houses have called in their salesmen, and are only quoting in reply to direct enquiries. Large buyers have in some cases expected that this emergency would develope unusual chances for buying, based on necessity of furnaces to realize. They have, however, been disappointed. Values have been maintained with a firmness that is surprising to the trade generally. There are several reasons for this; one is that in most cases the furnaces have their order books filled for deliveries for weeks to come, and are not compelled to book further business until January or later. Another is that values are already ruling extremely low, scarcely above the cost of production on the average, both North and South. In connection with this fact the latest reports show that stocks are still decreasing, and that the rate of production is being cut down. Another point that has been emphasized in the recent troubles is that when values of securities and properties supposed to be solid have shrunk alarmingly, pig iron has stood out as the only thing with intrinsic value sufficient to withstand all attacks. In the present temper of the market there will not be much effort by furnaces to sell until after turn of the year. Here and there a weak holder may be compelled to realize, but the total amount of iron thus situated is not thought to be large. The offerings in Cincinnati so far that have been under the market are on warrants which consumers usually expect to get at 50 cents under furnace price, as an offset for the unusual terms and risks pertaining to quality and weights. As to whether the general range of consumption will be materially cut down by the stock market panic, there is no means now of knowing. Views differ greatly. The current rate is enormous, and sellers are taxed to their utmost to supply it, in the face of the car famine which has not improved in the least. In consonance with the general feeling of uncertainty some small orders were placed in Detroit the past week, but they were made as small as possible, as no one could tell just what the outcome might be. Since the 21st, however, the feeling has been an improved one, and the prospect that labor troubles in the South may cause a suspension to a considerable extent in iron making in that section, will probably hasten buying for that class of metal. At full prices the Louisville market is quiet, buyers purchasing sparingly or holding off altogether until the money market becomes more settled. There have been buyers for as much as 20,000 tons to run through the year, basis of $10.00 for grey forge. The offer was declined as the price was too low, and the furnaces are not willing to sell for less than $10 50 for grey forge, and for deliveries running through six months. There have been offers of grey forge for prompt shipment at $10 25. This is regarded as an inside quotation. For the past few weeks the most important feature of pig iron at Buffalo has been its remarkable dullness. The past week the situation in this respect seems to have intensified rather than otherwise. Both consumers and producers are desirous of seeing some change for the better, and a firmer tone to the market. The steel rail situation is devoid of special interest. No data are available as yet for the sales for delivery during the year 1891.

Iron Ore. The close of the season is not marked with any features that call for comment. While ore freights during the past week or two have been slightly higher, the volume of receipts has considerably fallen off, as was naturally expected. With next Monday comes the end of navigation, although some half dozen of the staunchest steel steamers will make another trip to complete contracts. In the absence of reliable figures from the head of the lakes, as to the shipments for the season, it is impossible to review the business for the year, but enough is known to enable the statement to be made that it was not satisfactory, on the whole, to the ore interests. The season started out with prices that were too high to be maintained, and a great many concessions had to be made to the consumers. Judging from the present temper of the ore men, it is safe to say that they intend, next year, to hold off with their sales, ask a fair price, and mine no more than they can readily dispose of at that price.

Pig Iron. The situation is extremely quiet, and nothing new is expected until after this week, when the result of the conference among the producers of pig material, already alluded to last week, is likely to show itself in some definite form. Although the report of the meeting, as printed in these columns, was absolutely correct, some of the interested persons have seen fit to deny the facts, while others, prompted by a desire to help along the movement, admit the facts in parts only. It is not with a view to knocking down the coke price, say these furnacemen, that the meeting was held, but to bring about a better price for pig iron, for which purpose a general shut-down is to be inaugurated. On the other hand, it will matter very little to the consumers of pig iron for what particular reason the furnaces are going to blow out, as long as they do blow out. And the coke makers, who will find their markets circumscribed, will care more to remove the cause of the shut-down, than to investigate the particular and scientific economic reasons that prompt the action. In the meantime, one and another of the furnaces have been going out, so quietly as to attract very little attention, and that process is being continued as fast as opportunity offers. Some of them think this a good time for making general repairs, while others are not at a loss for a good reason. The Youngstown furnacemen's meeting has been adjourned subject to the call of the chairman, and it is not at all unlikely that another meeting will be held sometime next week.

A REPLY AND A PROPOSITION.

If the testimony upon which the Chattanooga *Tradesman* bases its support of the American scheme to introduce the English system of pig iron warrants is no stronger than that brought forward in its current issue, it would do well to retire for reinforcements. The sum and substance of its much boasted evidence is comprised in two letters from American blast furnacemen, and from two Englishmen. Even one of its American witnesses, "the manager of an important concern," while saying that his company had consented to join in the movement, frankly admits: "I do not myself believe it will be beneficial." We will hold the *Tradesman's* "testimony" in reserve, and will make it a proposition. It has seen fit to charge that *The Iron Trade Review* has "sought out every scrap of writing and every word spoken by producers and consumers in England," in order to "manufacture sentiment in America," and has "studiously avoided giving its readers the fact that there are two sides to the question." If we have "quoted liberally from English journals," it is only because of the mass of testimony against the scheme from the men who have tried it, and been disastrously affected by its speculative features, (which our Chattanooga contemporary still persists in minifying); but we deny that we have shown only one side of the question, and we direct attention to the fact that we have quoted very largely not only from the literature of the American warrant company itself, but also from the columns of its few but zealous supporters in Wall street and in the South. On the other hand, we direct attention to the fact that the Chattanooga *Tradesman* has from the first "studiously avoided" letting its readers know of the strong opposition to the scheme not only abroad, but at home; that it has refrained from giving even extracts from the many letters written by some of the strongest iron concerns in England against it, and that it seeks to avoid discussion on the vital issue, viz.: the essentially speculative character of the scheme, as clearly shown by eminent authority, the New York *Commercial Bulletin*, from which we quoted last week. Now we are anxious that the readers of the *Tradesman* should be enlightened in this matter, and we submit the following proposition: We will print without change from one to two pages of the best testimony our Chattanooga contemporary can furnish in favor of the warrant system, if it will print without change in its own columns an equivalent amount of testimony, which we shall offer *against* the system.

THE GREAT "CENTRAL WEST."

Here are a few figures from the census of 1890 worth study. The table embraces the States bordering upon the Great Lakes and speaks for itself:

State.	Population. 1890.	Population. 1880.	Increase. Number.	Increase. Percentage.
New York	5,981,934	5,082,871	899 063	17.69
Pennsylvania	5,248,574	4,282,891	965,683	22.55
Illinois	3,818,536	3 077,871	740,665	24.06
Ohio	3,6 6,719	3,198,062	468,657	14.65
Indiana	2,189 030	1,968,3 1	210,729	10.65
Michigan	2 089,~92	1,636,-37	452,855	27.66
Wisconsin	1,683 697	1,315,497	368,200	27.99
Minnesota	1,300,017	780,773	519,244	66.50
Total	25 978,299	21,353,203	4,625,096	25.47

Within these eight great States is comprised 40 per cent. of the population of the Union; and, what is better, despite the great migration to the West, South and Northwest, they hold identically the same relative position to the total population that they held ten years ago. The net increase during the decade has been equivalent to transplanting to this territory the equivalent in population of a state nearly as large as Pennsylvania. But not alone in population do they lead all other groups of States; their industrial and commercial supremacy is beyond question. We invite attention to and study of these significant figures.

THE SETTING HENS OF CANADIAN JOURNALISM.

Our Canadian contemporaries will pardon the illustration, but there seems to be too much of the setting hen spirit on their part about those Sudbury nickel deposits. The deposits have been there from time immemorial. The Canadian prospectors and settlers have been there also. They had every chance in the world to secure and profit by them. It was left, however, for American capital to discover their extent and value, and to purchase and develop them. No sooner does the great commercial value of the district appear (thanks to the shrewdness and enterprise of these same Americans) than some of the Canadian journals ruffle up their feathers, spread themselves over the nest which no longer belongs to them, and viciously peck at the American company in true old-hen style. One charges the Yankees with securing these valuable mines for a mere pittance. Another likens them to vultures. Another raises the cry that the Standard Oil Company has a finger in the pie. Another calls it "the Ohio nickel octopus." Another clamors for the imposition of an export duty, and so on.

The object of the export duty is to shut off the establishment of nickel refining works in Ohio, and force their erection in Canada. But even in this the setting hens of Canadian journalism are not agreed. So we have the doubly edifying spectacle of several leading papers flying at each other with wild and ungovernable fury. All of which is very amusing.

PROTECTION DID IT.

The six States bordering on the Great Chain of Lakes, viz., New York, Pennsylvania, Ohio, Illinois, Indiana and Michigan—produced in the census year of 1890, 4,203,760 tons of steel, or 96 3 per cent. of the total steel production of the country. This aggregate is nearly 100,000 tons greater than the total steel production of Great Britain in 1889.—[Cleveland Iron Trade Review.

Protection did it. The duty upon steel is much higher in the United States than in Canada—just enough higher to ensure the permanent establishment of the industry there. If Canada hopes to become a large producer of steel it can only be under similar circumstances.—[Canadian Manufacturer.

Truly said. Without Protection they never would have reached their present commanding position. As President Harrison well said, "It is a condition, not a theory, that confronts us.

Quoting in full the recent article in *The Iron Trade Review* on "'Hogging' the Basic Steel Patents," the *National Labor Tribune*, of Pittsburgh, says: "There can be no objection to inventors receiving liberal reward for their ingenuity and labor, but there is very decided objection to 'middle-men' buying up and monopolizing new processes which they do not use in practice, but through which they tax the industries great fortunes every year. These monopolies 'toil not, neither do they spin,' yet they have a sure thing on profits that in decency and honesty belong to the inventors and the industrial element." And the Baltimore *Manufacturer's Record* adds the significant remark that it "believes that the South will soon be absolutely independent of the basic patents for steel making."

ONE of the things discovered by our recent iron and steel visitors from abroad is the fact that "Mr. Carnegie is now the largest iron-master in the world." The gentleman making the discovery states that Mr. Carnegie, at his works at Pittsburgh, produces over 8,000-000 tons of pig iron per annum, which is about nine-tenths of the total quantity annually produced in Scotland; and in his coke works in the same locality he produces some 15,000 tons of coke per day, which is not only a much larger quantity than is produced in the whole of Scotland, but is probably not much short of the quantity produced in the whole county of Durham, hitherto the most important coal and coke producing field in the old world.

Reprinting *The Iron Trade Review's* recent article on iron-making in Marquette, the *Mining Journal* says: "Mr. Parker's paper has evidently impressed *The Iron Trade Review*, and that valuable publication very kindly gives the use of its columns to assisting in spreading abroad the facts collected and placed in such convincing form by him. The showing in favor of Marquette as a point for a coke iron industry is too striking not to attract the attention of iron men, and excite inquiry which will be certain to ultimately lead to one of the results that the business men of the city had in view when they entered on the movement to urge the advantages of the place for a diversity of manufacturing on the attention of the public."

THIS is the way it appears through the glass of our lively contemporary, the *Marine Review*: "*The Iron Trade Review* and Mr. T. D. Ledyard, who owns iron ore property in Ontario, Canada, have been engaged in a controversy, for some time past, over a statement from Mr. Ledyard to the effect that good Bessemer ores from Canada can be laid down in Cleveland for $3.90 a ton. On the docks of one of the river furnaces in Cleveland, there is a quantity of Ontario ore that has lain there for years. All attempts at roasting the sulphur out of it have failed. This is the ore which Mr. Ledyard refers to as good Bessemer ore, and there is no room for controversy."

AN esteemed Duluth contemporary, advocating the introduction of electricity for street car propulsion, heads a vigorous article on the subject as follows: "Push the Electric Car." Well, if the system to be introduced into Duluth is no better than that in vogue in some other cities, pushing will be a refreshing and agreeable step toward rapid transit.

Our sincere congratulations are hereby tendered to the Chicago *Journal of Commerce* upon its recent change of form.

RECOLLECTIONS OF AN OLD-TIME NAILER.

"Oh! wow, dod blast the nail," and he sticks his finger in his mouth, fires the hammer on the ground and executes an Indian green corn dance.

"Why does he say and do this? Oh, he just missed the nail and hit his finger nail. That's all. At last he picks up the hammer and gives the nail a blow that twists it into a shapeless mass of iron or steel, and does not heed the fact, that he has destroyed the usefulness of one of the oldest manufactured articles known to the handicraft arts, the making of the original nail, probably dating as far back as the art of working metals.

As long ago as 1606, a patent was granted for the cutting of nail rods. About 1810, a machine was perfected, after an outlay of more than $1,000,000 in an effort to get a satisfactory machine, which would cut about 100 nails a minute. Since that date improvements have been made on the nail cutting machine, until now the self-feeder has forced the hand feed machine out of the factories, and one boy can do the work of four men, as far as the feeding of machines is concerned. In other words one boy can attend to the feeding or placing the plates in the self-feeders, where formerly each machine had to be attended to by a nail feeder, or man to keep the plates turning and advancing them as the machine was fed. Formerly a visit to a nail factory revealed a long row of men sitting on stools, with bended backs, and every click of the machine, meant that the feeder must turn the plates over, and the dexterity of the feeder depended greatly on the swiftness with which he could turn the handle attachment to the grip which held the plate from which the nails were cut. American genius has done away with the long lines of men, the bending backs, and the necessity of the nail feeders' dexterity. The self-feeder does all that is necessary. It reduces the demand for labor, but it cheapens the cost of production.

The writer had an interesting talk with a well-known, skilled nailer, who is employed in the Valley mill, regarding the nail industry in this valley. For the information of those not conversant with the terms, a nailer is one who grinds the knives and tends to the keeping of the machines in repair, while a nail feeder is one whose duties only require him to feed the nail plates to the machine. The old nailer said: "The first nail factory west of the Alleghenies was erected at New Castle, Pa., during the forties. From that plant emanated the old Brown-Bonnell factory in this city. The largest nail factory in the United States is situated at Wheeling. It is owned by the Riverside Iron Co., and contains 226 cut nail machines. The Mahoning Valley Iron Co. here have 51 self-feeding nail machines in their factory. There are altogether 3 500 cut nail machines in operation west of the Allegheny mountains. From 1877 to 1883 the number of machines increased from 2,100 to 3,200.

"The history of the manufacture of steel cut nails dates back to 1885, and the recital of it would make a long story. Along the Ohio river from Steubenville, O., to Wheeling, West Va, there are 1,500 nail machines, and more nails are manufactured in the territory between these two cities than in any place in the United States. The rivalry and competition among the factories along the river grew so strong that the price of iron nails, despite the reduction of the price of labor and the increase in the ability to manufacture, that the business grew unprofitable. Firms were forced to use the cheapest grade of iron, and in so doing produced a nail which would sliver and split, and was of no value for building purposes. Each firm kept on the lookout for some way, by which they might improve the nail and manufacture the same so as to put it on the market in competition with their rivals. In 1885 the Riverside Iron Co., after many experiments, hit upon the plan of manufacturing the steel nail, and at once commenced to place nails made of steel upon the market. They at once sprang into favor, and at last their superiority made the demand for them so great that other firms followed in the footsteps of the Riverside Co. The factory at Bellaire was the second to manufacture steel nails; then the Junction mill at Mingo, Ohio. Others followed in rapid succession until, at the present day, there are no iron nails made west of the Alleghenies. And the Western steel nail is fast forcing the iron nail out of the Eastern markets. The Mahoning Valley Iron Co. is the only firm in these valleys that is manufacturing the pure steel nail.

"Regarding the wages paid for making steel nails, there is hardly any way to make fair comparisons. Before 1885 the average daily wages for a nailer was $10; at present the wages will probably average $4 a day. From 1865 to 1869 nails sold for $9 a keg. Puddlers were then getting $9 25 for puddling iron. In 1885 the price of nails had dropped to $2.25 a keg, and at present cut steel nails can be purchased for $1 90 a keg. When nails sold for $9 a keg, the nailers worked under the 30c card. In 1885, when the steel nail was introduced, the 21c card went into effect. It was during 1885-86 that the great nailers' strike was on. What was the reason for and outcome of that strike? Well, there are things we had better not dwell upon. The nailers are now working under a 14c card. Steel nails are usually made from the soft steel slabs. The slabs are originally 16 inches long by 2½ inches thick, and are rolled to the necessary thickness and length and cut in strips to make the necessary 'penny' of nail required. The average daily output of a machine is about 13 kegs of 8-penny nails. Nails run from 2-penny to the 7-inch spike, or 70-penny. Last year there were manufactured in the United States 8,000,000 kegs of nails. Two-thirds of this amount were cut nails, and the balance was made up of iron and wire nails.

"Regarding the relative merits of the cut and wire nail, we compare them on their holding power. Tests have been made by government officials, at which tests representatives of the cut and wire nail mills were present with the best samples of their manufacture. It was demonstrated at that test that the cut nail has three times the holding power of the wire nail. The wire nail is the easiest to drive but it is the easiest to pull out, and instances have occurred, where laths have been fastened on the ceiling with wire nails, and when the wood has dried out, the whole ceiling has fallen. In only one capacity can the wire nail claim a superiority over the cut nail. In box factories where they have nail driving machines, it is necessary to have a uniform head on the nail so that the nail may pass through the opening from the hopper, under the hammer. It is impossible to get a uniform head on a cut nail, on account of the roughness of the ends of the steel nail plate.

"The dangers of the business lie chiefly in the dust from the grindstones settling on the lungs, and producing what is termed 'nailer's consumption.' But every trade has its drawbacks, and men take chances to earn a living."—[Youngstown, (O.) Telegram.

POSSIBLE SAVINGS IN THE COAL ACCOUNT.

Very careful and long continued investigations into railroad accounts have shown to the officials of at least one railway system that the most important single item of saving that remains is to be found in the coal bill. This system is accordingly going very thoroughly into all the elements connected with the use of coal upon its locomotives. The investigation of this item up to date has led to the conclusion that the economies in coal using can be attained in three different ways. First, by getting better water; next, by instructing the enginemen in the art of firing, and third, in obtaining the best possible construction of fire-boxes and boilers. A number of other roads have also been working on the three lines indicated.

As to the water supply, it is apparently a question of the future as to whether the situation can be remedied either by looking after the original sources of supply, or, in case improvement cannot be attained there, by purifying the water, either before putting it into the tender, or as it is entering the boiler. Much can be done by examining the natural supply, and arranging for replacing that supply when found bad, but in many cases only a little can be done in this way. In such cases it becomes necessary to take up the question of purification. Boiler compounds cannot be said, as a general thing, to be in good repute. The purification of water in tanks before taking it into the tender seems to be generally conceded to be the proper method of handling this difficulty, but the enormous expenses of the necessary plant form a serious and very effective obstacle in the way of adopting this method. Several methods of purifying the water after it leaves the tender and before it enters the main body of water in the boiler have been tried with varying degrees of success. We may say in general of this class of devices that there seems to be almost as much difficulty in keeping the purifying apparatus free from sediment and scale as there was originally in keeping the boiler clean. So, as we have said, the water problem still awaits solution.

As to the second line of reform for securing lower coal bills—that is, in the better drill and instruction of enginemen in regard to the economical handling of coal in firing—this has been followed up very successfully by a number of roads, and is not only producing excellent results, but promises well for the future, as the elements of combustion become better known.

The third possible source of saving, viz: improved construction of fire-boxes and boilers, has for years been carefully studied. There has been a great deal of progress made in this direction, but it has not been a uniform progress. Fire-box construction has been a hobby with many good mechanics, and also with many mechanics of an indifferent order. Accordingly, on more than one road, has a progressive step been taken towards better construction, only to be abandoned.

It is generally conceded that a deflector in the flame-way, either in the shape of a brick arch or water table, is necessary to produce the best results in combustion. The relative merits of the brick arch and the water table are still under discussion, but experiments now being made will, we trust, throw conclusive light on this question.

Another concession generally made is that provision should be made for a plentiful supply of air through and above the grate, although such provision is not by any means generally found in practice. Careful investigators assert that this air supply should equal 40 per cent. of the grate area, and that the openings above the grates should equal from 1-60th to 1-50th of the grate area in engines fitted with brick arches or water tables, and one-third of that amount in engines with plain fire boxes. Past practice in grate design has resulted in choking up the grate so that, in order that sufficient air might enter, a draught too strong to produce economical results has been necessitated. This error should be rectified, and can be easily, due regard being had, of course, to the strength of the grates and their ability to retain the fire. Light fires are considered better than heavy fires, but it is urged by careful experimenters that it is better when using light coal to use a softer blast and a heavier fire than to attempt to close up the grates.—[Railway Master Mechanic.

Another Nickel Steel Victory.

Commander F. M. Barber, United States Navy, recently received the following cable dispatch concerning the latest trial of armor in Europe: "The Russian navy made a comparative test of three plates, at Ochta, the 11th of this month. The plates were 10 inches thick. One was of plain steel, made by Schneider & Co, of Le Creusot, France; the second was a compound plate made by Brown & Co., of Sheffield, Eng, and the third was a steel plate made by Vickers, of Sheffield. Each plate received five 6-inch Holtzer chrome steel projectiles, weighing 90 pounds each. The first two were fired with a striking velocity of 1,900-foot seconds, and the three others with 2,190-foot seconds. The Schneider plate arrested all the projectiles, and broke three of them. The penetrations were 22 and 27 cm. In the Brown plate the first two penetrated 34 cm., the three others traversed the plate and backing, and fell 750 m. in the rear. In the Vickers plate the penetrations were 53 cm. The Brown plate showed large cracks; the two steel plates had only fine cracks. The trial showed once more the absolute inferiority of the compound plate, and the superiority of the Schneider plate, a superiority which would have been greater if the plate fired at at Ochta, and delivered by the Le Creusot works, a year ago, had been of the same fabrication as the nickel steel plate tried at Annapolis, embodying the latest improvements in the Schneider plates."

THE FINANCIAL SITUATION FROM A CONSERVATIVE STANDPOINT.

The wide currency which the press has given to the late monetary disturbances at New York has brought out a number of inquiries from country bankers and others as to the true condition of the metropolitan institutions. It is our pleasure to assure our friends that there are no elements in the financial situation at present upon which to ground fears for any larger and more deep searching disasters than those which have already taken place. For the restoration of confidence we are wholly indebted to the promptness, foresight and patriotic attitude of the bankers of New York City, and we compliment them on the unflinching courage which they displayed, in the midst of a crisis that seemed for a moment to threaten even the most firmly grounded banking and commercial credit in the land. By unanimous action they established the means for meeting every demand of the mercantile community, and forbare to lay any unnecessaay pressure upon their creditors in a direful emergency. It was a trying test, and nobly did the bankers meet it.

Our friends undoubtedly understand the causes which brought about the disturbance in the stock market. The decline in securities was a sympathetic movement based upon the fall in prices on the London market. It is known that prominent English houses have imperilled their solvency by placing enormous loans in Argentine, and in order to protect disaster to their credit, began to flood the market with their holdings of American stocks. The situation in London was immediately repeated here. Rumors, involving the soundness of banking houses against which there could be no reasonable suspicion, added to the abnormal caution of lenders to the detriment of security holders who were compelled to realize. Two or three of the smaller banks in New York, which had exceeded the limit of prudence and abused their natural privileges in making loans to stock brokers, found themselves in a position where it was no longer safe to hold collateral of constantly and rapidly diminishing value; so that, when the demand for loans had reached proportions commensurate with the growing feeling of distrust, they were no longer able to draw upon assets which the declining and panicky market had put beyond the influence of liquidation.

The reader will draw from the premises that the conditions which caused the disturbances in the financial world could affect only such brokerage houses which had impoverished their resources, while the vast body of our influential banking institutions, who have in their keeping the credit and solidity of the commercial world, were left undisturbed. It is true, that all the streams which contributed to this strong flood of liquidation are not on the surface, and an analysis of the situation would not be complete without consideration of the reserve forces of the associated banks of New York. Heavy shipments to the West and South, the diminished resources of the Treasury, and other factors common to our monetary movements, were a part of the situation, and added to the characteristics which it manifested. Deposits have also slightly fallen, not through distrust of the business operations of the banks, but because ready funds were made immediately available for small mercantile extensions and building operations.

Although these considerations have influenced one or more of the minor banks to timidly call in their loans, and refuse to extend further favors, the operations of the banks, on the whole, have not been interrupted to any serious extent, and reputable merchants have not failed to get all the accommodation they needed. In the very height of the excitement, when it did not need a conservative spirit to suggest restrictive measures in the matter of discounts, the regular customers were served at rates which hardly gave an inkling into the abnormal state of the money market—6 to 8 per cent.; and the statements, which, unfortunately, have received some credence outside of well-informed circles, that there was a final movement among the banks to contract their loaning functions, or suspend operations in that line entirely, came from irresponsible sources of a bearish nature.

Experienced economists who have carefully observed the financial movements of the last few weeks feel convinced that the great panics of history can be no longer repeated. They derive this assurance primarily from the action of the clearing house, which has shown itself to be a most potent agent against the miscarriage of credit, and the dissipation of confidence. By depositing securities of unquestionable intrinsic value, which has been temporarily effaced by the fluctuation of the stock market, any bank connected with the association can get a loan in clearing-house certificates up to 75 per cent. of the par value of the collateral which it pledges. The success of this action was felt immediately in the return of a better tone in the loan market. Against the combined resources of the metropolitan banks the agencies of panic found themselves utterly powerless. Not only did the one or two temporarily embarrassed banks avail themselves of the inexhaustible resources thus held out to them, but other institutions, which had reached the limit of their legal right to loan, were thereby enabled to amplify their favors to the mercantile community. The ability to do this in such a time of monetary stringency changed the situation at once. The stock market began to recover because values had found a perfect protector in the loans of the clearing-house, and the money market relaxed because the resources of the banks were to be replenished from a permanent supply of funds. Subsequently, the clearing-house passed a resolution to issue certificates to all members, so that the impairment of the loaning facilities is now absolutely out of the question.—[American Banker.

Percentage of Phosphorus Required in the Basic Bessemer Process.

"H. M. H." writes the *Engineering and Mining Journal:* "Many of us have doubted whether the basic Bessemer process was likely to be used extensively in this country, because few important ore beds contain enough phosphorus to yield a pig iron sufficiently phosphoric for this process. In the acid Bessemer process, the necessary heat is supplied by the oxidation of the silicon of the pig iron. It is not expedient in the basic Bessemer process to use a pig iron containing much silicon, and the heat needed must come from the oxidation of phosphorus and manganese—perhaps supplemented by iron. Hence a highly phosphoric pig is deemed essential for the basic Bessemer process. But we find that, in the acid Bessemer process, thanks to our very rapid running, to the consequently very short intervals between blows, and to the small loss of heat by radiation from the converter during those brief intervals, the pig iron need contain only about one-third as much silicon as is needed in European acid Bessemer practice. Under favorable conditions we blow iron with only 0.70 per cent. of silicon. Now, I want to point out that the very same cause, short intervals between heats due to rapid running, which has led to our using, in the acid Bessemer process, pig iron with only one-third as much silicon as is needed in Europe, may in the future lead to our using, in the basic Bessemer process, pig iron with only one-half or even one-third as much phosphorus as is needed in Europe; and that, hence, the particular reason for doubting whether we can use the basic Bessemer process extensively in this country, loses its force, for we have plenty of ore beds which will yield a pig iron containing 1 per cent. of phosphorus."

Growth of the Structural Iron Trade.

The impression has been created by the rapid increase in the number of large fire-proof buildings in our leading cities that the consumption of iron and steel beams must have developed at a tremendous rate. So far as we can learn that is not the case, the production being at the rate of about 100,000 tons per annum, while it was 90,000 tons two years since. As compared with the consumption of barb wire, tin plate or nails, this quantity is very moderate indeed. It sinks into insignificance beside the demand for rails or pig iron for foundry purposes. It has been urged that the consumption of beams would increase enormously were the price lower. In Germany, where the demand is far more widespread, the beam manufacturers have adopted a simple method of introducing their wares. The village builders have been accustomed to follow certain rules based on experience for determining the dimensions of the timber used for certain spans. The rolling mills got out books giving the exact equivalents in strength of the different sizes of sticks of timber so used, with the price of the steel beam, delivered. Thus the small builder is placed in the position to tell at a glance whether it is cheaper for him to supplant wood with steel. It is reported that the consumption for small buildings has grown in an extraordinary degree. Still, we question whether such a result could be reached in this country, because the relative cost of timber and steel is quite different. How it will be upon completion of the increased capacity for manufacturing beams now being provided is another question. The trade looks forward to a lowering in prices when the additions to plant are completed.—[Metal Worker.

Results of the Natural Gas Deals.

Pittsburgh letter to the Philadelphia *Record:* Those who invested their money in natural gas stock, and who see what they paid $50 and more per share for going begging for less than one-half that sum are less cheerful, but they are not making much noise. The fact is, that if all the plants of the natural gas companies should be declared worthless to-morrow, comparatively few holders would lose much money actually invested. For the past three years the natural gas business of Pittsburgh has been controlled by two concerns—the Philadelphia Co., with a capital stock of $7,500,000, and the People's Natural Gas Co., with a capital stock of $1,000,000. Thirteen other companies have been organized and begun business since the introduction of natural gas, but with the exception of two that have failed because of mismanagement, all have been absorbed by the Philadelphia and People's Cos., and the gross apparent capitalization of these corporations is over $17,000,000. All intelligent Pittsburghers know that this great capital represents $6,000 000 of cash actually invested, and that the balance is water. Yet for at least five years dividends ranging from 6 to 12 per cent. per annum have been paid on the total capitalization.

Enlargement of Canadian Canals.

The Dominion Government in pursuance of their policy with regard to the enlargement and deepening of the St. Lawrence canal system to a 14-ft. draft have called for tenders, to be received up to 3d December, for the construction of a lift lock, weirs, etc., at Morrisburg, and the deepening and enlargment of the Rapide Plat Canal. The work will be divided into three sections, each about a mile in length, and will involve the expenditure of upwards of a million dollars. A map of the locality, together with plans and specifications of the respective works, can be seen on and after the 19th instant at the office of the Secretary of the Railway and Canals Department, Ottawa,

A Peculiar Effect of Hammer Vibration.

A somewhat singular circumstance recently occurred at Chatham (Eng.) dock yard, in connection with the large clock at that establishment, by the time of which the duties are carried on throughout the whole of the departments. For some time past the clock has been going in an irregular and erratic manner, occasioned, it is now ascertained, by the proximity of the iron vessels which are under construction, the perpetual hammering, and consequent vibration, so interfering with the works of the clock that it has been decided to remove the clock tower to another part of the dock yard.—[Engineering.

The Pennsylvania Ship Canal.

The commissson appointed by Governor Beaver to examine into the feasibility of a ship canal between Lake Erie and the Ohio River, met in Pittsburgh, Pa., November 12. The report of the engineers showed that such a canal is feasible. The route surveyed is 125 miles long. Several routes have been surveyed, and the one selected is not a difficult one. The total lockage required is only 730 feet, to be overcome by 39 locks. The estimated cost is $23,000,000 for a canal having twelve feet of water, to accommodate the largest steamers which ply on the lakes.

AMONG THE IRON MINES.

Lake Superior Mining Notes:—

MARQUETTE RANGE.

At the Elba mine they have crosscutted the ore formation, and in a winze being sunk have found ore of good quality. Above this the ore has been considerably mixed owing to the fact that they were too near surface, the drift having mixed with it. They will employ a diamond drill to cut through the formation on the footwall side, it being thought that there is a possibility of a deposit of merchantable ore being found in that direction. Those interested think the Elba will develop into a good property as soon as they get fairly into the deposit.—[Iron Ore.

MENOMINEE RANGE.

The Mansfield will close the shipping season with an output of 18,000 tons, which is a most excellent record for so young a property during the first year of its existence. It is altogether likely that the Mansfield will ship several thousand tons by rail during the coming Winter. The Florence also shipped 18,000 tons of ore during its first year (1880).—[Florence Mining News.

The interest in the Appleton exploration continues to increase and there now seems no doubt of the value of the property and the existence of a future mine.—[Norway Current.

At the Commonwealth, the hoisting at the Davidson Pit has been suspended for the season and sinking and other opening work for next year's shipments have begun. This pit sent out for 1890, 44,000 tons of ore, and were it deemed best, this output could bave easily been increased to 50,000 tons.—[Florence Mining News.

The Mansfield mine will round up this season with an output of between 18,000 and 20,000 tons, which is considerably short of the estimate made early in the year, but everything considered, is much better than expected. The ore from the first level has been removed on the length about 400 feet and the level timbered, the Norrie system being employed, which is unquestionably the most effective method known. The second level is the point of mining at present, the exploitation being followed with timbering as above; there yet remains a large block of ore in the second level, which will be removed to the extent, or even more, than the work in the first level. The vein here has the same characteristics as above with the one exception of having increased in width about four feet, giving evidence that the vein will continue to widen to the extent of its depth. There is still an abundance of water to contend with, but it is well handled, and occasions no inconvenience. The main shaft is 150 feet deep from which the two levels mentioned are operated; during the Winter the shaft will be given an additional depth to accommodate three levels, and it is expected by the opening of navigation another year mining can be carried on from three levels. With a double skip road and the best of machinery, and better still, good management, the mine will make a record in '91 that will be a general surprise. Mining will be continued throughout the Winter without abatement, and 20,000 tons of ore placed in stock, if possible. Dock room and trestles are now being constructed for that purpose. The character of the ore holds up to a Bessemer, the percentage of phosphorus lessening if anything.—[Diamond Drill.

At the Chapin, "D" shaft is down 60 feet below the fifth level, and a very short time will finish it to the sixth. Connection has been made between "C1" and "D1" at the seventh level and the connections between "C" and "C1" and between "B" and "C" will be made within a few weeks. While most of this work is being done in the ore, and the daily product is thus being added to, it is only development for the next and succeeding years. The buildings for the new pumping and hoisting machinery at "D" are nearing completion.—[Norway Current.

GOGEBIC RANGE.

The Anvil has closed its shipments to the docks for the season, and during the Winter months a great deal of development work will be done. Shafts will be sunk to a greater depth, and new levels opened up. The shipments from the Anvil this season amount to about 42,000 tons—[Florence Mining News.

At the Minnewawa the miners are engaged in drifting at a depth of 400 feet. To the west the drift is running in a fine quality of ore, and there are indications of a large lens in that direction. The sinking of No. 2 shaft will be commenced in a short time. The managers have strong expectations that the Minnewawa will develop into a good shipping property before spring.—[Florence Mining News.

Seetion 25 mine shipped its last load of ore to the Ashland dock on Monday last. This mine, which is one of the young ones, stands at the top of all shippers west of the Montreal river, and has placed to her credit over 125,000 tons. This property is in excellent condition, and will next season excel the shipments of the present season. Large stockpiles will be made this Winter, which will make shipments lively in the Spring.—[Florence Mining News.

Matters connected with the Germania mine are at present looking more encouraging than at any time in the history of the property. Three shafts are being sunk to new levels, and all of these are going down in a fine quality of ore, while other developments to the west show the existence of large deposits. From every indication the Germania will soon become one of the big mines on the range.—[Florence Mining News.

The crosscut in the Daylight mine is now into 35 feet of as clean and pretty ore as can be found on the range.—[Miner.

A Hurley correspondent of the Ashland *Press* writes as follows concerning some of the mining properties in that region: East of Section 33 mine lie three neglected properties. At the time of the "boom" they were all working, but soon after the collapse of the stock bubble they were shut down. Work was resumed this Summer on each, and is meeting with encouraging prospects. The Jupiter Iron Mining Co. has the option on the land lying north of the Moore. The ore body has been located, and followed for nearly 200 feet. In width, the lens varies from ten to 20 feet. A new working shaft is being sunk near the exploring shaft, in which the ore body was discovered. This property will ship next season, and the owners are especially deserving of success, for the reason that they have never given up even when all work near them was abandoned. The Montreal River Mining Co., one of the first shipping mines developed on the range, has nearly exhausted the ore lying above the dike on the east end of its territory, and is working with fair success on the extreme west, near the Hennepin mine. At a depth of 200 feet a crosscut has shown the vein to be 50 feet in width. This lens of ore is the extension of the Hennepin lens, which dips down as it runs east. It is expected that one or more of the shafts further east will be sunk to greater depth in order to strike and develop this new ore body. The Montreal promises to take a leading position among the Wisconsin mines next season. Section 33 Mining Co. has shipped steadily and heavily to lower lake ports and to local furnaces, to the extent of over 100,000 tons of iron ore this season. Two veins, the north and the south, are being worked, mainly on the west end of the property, near the Montreal mine. Explorations are being extended toward the east, and will be pushed this Winter. This property has recently been thoroughly equipped with new machinery, and this is in a very flourishing and prosperous condition.

VERMILION AND MESABA RANGES.

But a few years ago, the iron district of Northern Minnesota was but little known and attracted comparatively slight attention. A small number of men who possessed faith in the ultimate future of the country, were the only ones who persevered in their efforts to convince the people of the country at large, that beneath Minnesota's rock-ribbed hills lay vast bodies of iron ore, awaiting but the touch of labor to convert it into tangible wealth. Through rain and snow and against all oppositions these men toiled and plodded, and at last have had the satisfaction of showing the doubters that the unexplored district in the northern part of Minnesota was the richest portion of the State. It has taken a long time to establish this fact. Reports of all kinds were circulated which had a tendency to detract from the value of previous discoveries. Persons who, doubtless, had private interests to serve, contributed no little to this agitation, and aided in building up a feeling of distrust. On the Mesaba it was said that the formation was a flat one, and that the ore existed merely in bunches or pockets. That a large portion of the ore contained titanic acid, and was practically worthless. The first of these reports is now demonstrated to be false. The second, so far as it relates to any considerable portion of the range, is equally false. At the Mallman mine, a large body of ore laying between well defined walls has been shown up. It is within the Bessemer limit in phosphorus, and is free from titanium. With this encouragement explorers will redouble their efforts, and it is reasonably certain that they will be rewarded by discoveries of equal value with those already made. On the Vermilion several important discoveries have been made during the past Summer, and at present great activity is being displayed by those holding options on land, or owning the fee. The unfortunate delay, caused in several instances by a contest regarding ownership, will undoubtedly be settled shortly, in at least some of the cases, and the result will be a boom for those properties. At several explorations which have been worked in a small way in the past Summer, arrangements are being made to conduct operations on an extensive scale the coming year. Many of these have good prospects ahead, and at least some of them are reasonably sure to develop into good mines. One thing is certain, those who wish to get in "on the ground floor" in Minnesota mining property have no time to lose. What are known as explorations now will, in many instances, be mines next year, and the cry from the disappointed ones will be, "too late!" Just cut this out and paste it in your hat.—[Duluth Tribune.

Siemens and Siemens-Martin Steel.

It is a common mistake, even among those who should be familiar with such matters, to confound Siemens-Martin steel with Siemens steel pure and simple, says the *Bulletin*. The two steels are manufactured by essentially different processes, the former by the Martin process in a Siemens regenerative furnace, hence the compound name, and the latter by the Siemens process proper. Mr. F. J. R. Canella, a steel works manager of Wales, makes the following clear distinction:

"In the earlier, or Siemens-Martin process, malleable iron, wrought scrap, or scrap steel is melted in a bath of pig iron, from which the impurities are eliminated solely by the action of the flames, and the addition of spiegel or ferro-manganese. Wrought metal or scrap is an essential element of the process, and no ore is used. In the Siemens process, on the other hand, a much larger relative quantity of pig iron is employed, and although scrap is also generally worked up, the process can very well do without it. Then, again, the impurities are driven out from the pig iron by the addition to the bath of a properly-selected iron ore, which becomes reduced, while its oxygen carries away the carbon and assists in the formation of a silicious slag. Both processes require Mushet's addition of ferro-manganese at the end, a common need for most steel-making processes. It will require very little further explanation to show that the Siemens process lends itself more readily than the Siemens-Martin to the production of large quantities of a high-class material of uniform nature, as pig iron and iron ore of the necessary quality are always available in any required amounts, whereas wrought iron scrap and scrap steel are very difficult to procure in quantity, and of the requisite quality."

Reduced Rates for the Holidays.

In order to enable its patrons to spend the holidays with their friends, the Wheeling & Lake Erie Railway will sell excursion tickets from all stations to all stations. Tickets will be sold on December 24th, 25th and 31st, 1890, and January 1st, 1891, and good for return passage up to and including January 5th, 1891. Children under five years of age, free; between the ages of 5 and 12, half excursion rates.

RICHMOND MEETING OF AMERICAN MECHANICAL ENGINEERS.

One of the most successful meetings ever held by this flourishing society was held at Richmond, Va., November 11th to 14th. About 150 members were present, together with 50 ladies. Nineteen technical papers were presented and discussed. Reports were presented by special committees on Methods of Testing Materials, Duty Trials of Pumping Engines, Tests of Locomotive Efficiencies, and Uniformity of Flanges of Pipe Couplings.

The following officers were elected: President, Robert W. Hunt, Chicago; Vice-presidents for two years, Stephen W. Baldwin, New York; John F. Parkhurst, Cleveland, and Alexander Gordon, Hamilton, O. Managers for three years, Andrew Fletcher, New York; W. R. Warner, Cleveland, and Coleman Sellers, Jr., Philadelphia. The social part of the meeting included a reception by the Governor of Virginia, at the gubernatorial mansion on Tuesday evening; a steamboat excursion down the James river on Wednesday, visiting the seven United States monitors, the historical Drewry's Bluff and Dutch Gap; carriage rides and visits to various points of interest in Richmond on Thursday, including an inspection of the Tredegar Iron Works and the Richmond Locomotive Works, and a reception by the citizens of Richmond on Thursday evening. On Friday, 14th, the whole day was devoted to an excursion via the Chesapeake & Ohio Railroad to the yards of the Newport News Ship Building Co., thence by boat to the Portsmouth Navy Yard, where the United States battle ship "Texas" was inspected, and to Norfolk, where several places of interest were visited.

We give from the *Engineering and Mining Journal* brief notes of the papers presented at the meeting:

AUTHORITIES ON THE STEAM JACKET—FACTS AND CURRENT OPINION.

BY R. H. THURSTON.

Great differences of opinion have been manifested in recent discussions as to the value of steam jackets, and Dr. Thurston has made a most interesting compilation, covering 40 pages, of figures and opinions, which, as he states, may be used as an introduction to a more formal discussion of the philosophy of the steam jacket. He believes that such discussion will probably largely reconcile the apparently conflicting opinions by exhibiting the fact that the jacket may, under different circumstances, prove a decided advantage, an unimportant appurtenance to the engine, or even, under exceptional conditions, deleterious to efficiency. A summary of results by various authorities shows that the gain by use of a steam jacket ranges all the way from zero up to over 30 per cent.

CHIMNEY DRAUGHT—FACTS AND THEORIES.

BY R. H. THURSTON.

This paper is a discussion of the question whether there exists a temperature of maximum delivery of gas, as indicated by the theory of Peclet and Rankin. It gives the results of an investigation made under the directions of Dr. Thurston, with a chimney 20 inches in diameter and 32 feet in height, to determine whether there was any maximum in the vicinity of 600 degrees F., such as the commonly received theories give. The result in some cases showed an apparent maximum at about 700 degrees F., but in other cases showed no maximum within the range of temperature observed, or up to 1,000 degrees F. The paper criticises the form of Rankin's formula, and frames a new theory which indicates that the temperature of maximum draught will be rarely found at less than 700 or 800 degrees, or very probably 1,000 degrees F. The author admits, however, that the conditions involved are so numerous and so variable that it is doubtful if any analysis can be made which will be sufficiently simple, convenient or accurate to come into general use in the solution of the problem, and that current successful practice rather than theory must continue to be our guide in the design of chimneys.

LIGHT CABLE ROAD CONSTRUCTION.

BY FRANK VAN VLECK.

Advocates of electric traction have asserted that cable roads can not be built as a single track system, but the author states that such roads are in operation in the far West, and gives the details of the construction of a single track road in San Diego, Cal. The road in that city was first operated as an electric road for about a year, when deficiencies of construction, improper design, inability to ascend grades, and large leakages of electricity and consequent loss of power, compelled the company to cease operation. The franchise and equipment were then purchased by a company which has introduced the single-track cable system, and has just put it into operation. The author admits that the day of usefulness for the cable road on a level has forever gone, and that the electric road stands champion of the field; but there are some things the electric road as at present constructed cannot do, and for which the cable road is especially adapted, such as ascending steep grades. The paper contains descriptions and illustrations of the details used in the San Diego road, such as yokes, sheaves, grips, winding drums, etc.

HYDRAULIC TRAVELING CRANES.

BY ERWIN GRAVES.

The author describes and illustrates a new form of foundry traveling crane, in which all the motions are obtained by hydraulic pressure. Two vertical cylinders, one at each end of the foundry, causes the motion of the bridge along the rails, two others horizontally placed at the level of the bridge and at one end of the foundry move the trolley upon the bridge, and a single vertical cylinder raises and lowers the fall block. All the operations are controlled by hydraulic valves located in a convenient "pulpit," as in the cranes and other hydraulic machinery used in steel works. Two such cranes, each of 15,000 pounds' capacity, have been in constant use over two years, giving entire satisfaction, the only repairs needed being the renewal of the packing of the rams. One man operates both cranes, and there never has been a man injured, or mishap of any kind resulting from their use.

AUTOMATIC REGULATION OF INJECTION WATER TO VAPOR CONDENSERS.

BY JAMES M'BRIDE.

In the operation of concentrating liquors in vacuum pans, as in the manufacture of sugar, the quantity of steam used is often variable; and the quantity of liquor fed to the pans also varies, the proportions of the two constantly changing. In such cases sometimes too little and sometimes too much water is used in the condensers, and the pan man, to be on the safe side, is apt to use more water than is necessary, thus increasing the cost of manufacture by needless waste of water. The water describes an automatic device for controlling the quantity of injection water, which consists of a mercurial thermostat, which opens or closes the injection valve, and which is operated by a rise or fall in the temperature of the water discharged. In practice it has been found to keep the temperature of the hot well constant within two degrees F., and it also shuts off the supply of water when steam is shut off. No difficulty has been found in carrying a vacuum of 26 inches with a hot well temperature of 120 degrees.

A NOVEL FORM OF FLEXIBLE TUBING.

BY T. R. ALMOND.

This paper describes the realization of the "wild idea" of a metallic tube, which is quite flexible, and yet which will convey gases, steam or liquids under considerable pressure. It is made by coiling a round wire around a mandrel, and then interposing a triangular-shaped wire between the coils of round wire. The triangular wire is pressed between the coils of round wire with sufficient force to spread them apart, so that the contact surfaces are at all times under pressure. When the tube so constructed is bent the convolutions of the triangular coil adjust themselves to the spaces between the round wire, the two coils remaining in contact under pressure and gas tight. Tubes have been made on this plan up to 5 16 inch diameter.

AN INTERESTING EXPERIMENT WITH A LUBRICANT.

BY G. W. BISSELL.

The experiment referred to was undertaken for the purpose of determining the variation of the co-efficient of friction of a lubricant, the rate of feed of the same to the journal being varied and all other conditions constant. The temperature was maintained constant by circulation of water through the brasses of the Thurston railroad-lubricant testing machine, which was used in the experiments. Tests were made with loads of 2,000, 3,000 and 4 000 pounds on the journal, corresponding to about 70, 105 and 140 pounds per square inch. The results indicate that with low rates of feed the effect of pressure on the co-efficient of friction is practically *nil*, which would tend to prove that under such conditions lubricating rubbing surfaces follow the laws of solid or "immediate" friction; but at the rate at which this state of affairs begins to be apparent the argumentation of the co-efficient is dangerous to the continuance of the smooth running of the journal. It is unsafe to reduce the rate of feed below .003 c. c. per square inch of projected area of journal per minute.

HEAT TRANSMISSION THROUGH CAST IRON PLATES PICKLED IN NITRIC ACID.

BY R. C. CARPENTER.

Experiments were made to ascertain the relative heat transmission through cast iron plates in the condition in which they leave the foundry as compared with the same plates treated with dilute nitric acid for the periods respectively of 9, 18 and 40 days. The results show a marked change in the conducting power of the plates due to a prolonged treatment with dilute nitric acid, and, the author concludes, would indicate that a beneficial effect might be expected by treating the castings of steam engine cylinders in such a bath. The action of the acid by dissolving the iron and not attacking the carbon forms a protecting surface to the iron, which is largely composed of carbon. The following figures show the relative transmission of heat through plates pickled in a 1 per cent. nitric acid solution and in a 5 per cent. solution respectively, as compared with an untreated plate, with the skin on, but free from rust, taken as 100:

Length of treatment.		9 days.	18 days.	40 days.
Relative heat transmitted through plates pickled in	1 per cent. solution	86.3	70.7	68.7
	5 per cent. "	76.8	70.0	68.5

ROPE DRIVING.

BY CHAS. W. HUNT.

This paper describes some of the limitations of the method of conveying power by cotton or manilla ropes, which will enable the engineer to decide upon the relative advantage or disadvantage of any proposed speed. The author discusses the horse-power, wear of rope, first cost of rope, and catenary, as the principal questions involved, giving formula and diagrams for each.

A SINGLE-ACTING COMPOUND ENGINE.

BY WILLIAM A. BOLE.

The engine described and illustrated in this paper is of the type so well known in the Westinghouse compound engine. The cranks are at 180 degrees, and there is no receiver space between the high and low-pressure cylinders. A single piston valve working across the top of the cylinders distributes the steam to both. A shifting eccentric is used, giving a variable compression in both cylinders. The compression in the high-pressure cylinder is brought up to the initial pressure, and neither above nor below it, by properly proportioning the clearance volume of the high pressure cylinder and the relative displacement of both pistons. It is claimed that the engine improves in tightness with use, a test of a new engine, 12 inches × 20 inches × 12 inches, showing a water

consumption of 25.42 pounds of water per indicated horse-power per hour, but after six months' service it showed a consumption of only 22.35 pounds.

ACCIDENT-PREVENTING DEVICES APPLIED TO MACHINES.

BY JOHN H. COOPER.

The following is an extract: "Loss of life or limb to an operative very often means the loss of a skilled 'hand' to an important industry, as well as the loss to a family of its chief means of support. It may add to the burden of public institutions, and may lessen the productive power of our mills. Therefore, the prevention of accidents in a humanitarian sense, as well as in a commercial one, should be a matter of deep intetest to us, demanding the exercise of ingenuity in the devising of effective means for securing this end. The subject is a broad one, and this paper proposes to merely touch it at a few salient points, and there to leave it to the humanely wise, to whom a hint is sufficient."

The paper contains a number of hints, and some descriptions of accident-preventing appliances, such as safety valves, independently driven feed-pumps, "breaking pieces," instantaneously acting stop motions for looms, relief valves for cylinders, safety pinions, guards and guides for punching presses, duplication of steam valve disks to prevent engines from "running away" when the governor belt breads, netting for mine cages, belt rests and carriers, guards to sheaves, etc. The use of strictly enforced rules and regulations is also touched upon. The paper is very good as far as it goes, but it does not go far enough. The subject is one which can scarcely be properly presented in a brief paper before a technical society; it ought to form the burden of a report of a committee, and a large book might be written upon it. We throw out this "hint" for Mr. Cooper's benefit.

NEW PROCESS FOR CUTTING TEETH OF SPUR WHEELS.

BY AMBROSE SWASEY.

In the new process, which is the subject of this paper, instead of making all gears so that they will run into a rack, the rack is transformed into a cutting tool, and by it the teeth of wheels of any diameter are generated and cut at the same time. The author has designed a remarkably ingenious gear generating and cutting engine for the purpose of reducing to practice the principles of the process. The cutting tool, which takes the place of the rack, is composed of a series of cutters rigidly connected, which revolve, and at the same time move longitudinally or endwise in line of their common axis, and at right angles to the axis of the wheel to be cut, and at the same speed as it is continually revolving at the pitch line, the motions being the same as in the case of a rack engaging with revolving gear.

HYDRAULIC HOISTING PLANT FOR PIER OF BROOKLYN SUGAR REFINING COMPANY.

BY LOUIS G. ENGEL.

The work to be done was the unloading of packages weighing from 1,200 pounds to 2,600 pounds from vessels alongside of the pier, including the drag along the intermediate decks to the hatches, and the transfer of part of the packages to the second floor of the pier for storage. The disadvantages of separate steam engines and of shafting and friction drums for the purpose are discussed, and balanced against the disadvantages of a hydraulic system, which are danger of freezing and first cost. The first of these is expected to be overcome by a non-freezing mixture, and the second to be offset by economy of operation. The plant consists of a Worthington duplex pump, 20½ × 4½ × 15, for 800 pounds water pressure and 800 gallons per minute; a Rumsey rotary drip pump, two accumulators, 10 inches diameter, by eight feet stroke, loaded with 30,000 pounds of pig iron contained in a wrought iron tub; high-pressure pipes, 5, 4 and 3 inches diameter, tested to 2,500 pounds per square inch; tanks for suction and drip, four whip hoists for unloading and two platform elevators. All of these were described and illustrated in detail. The plant, except the pumps, was constructed by Otis Bros. & Co., of New York. The design of the details is due to Randolph C. Smith, and follows as nearly as possible the requirements of the London water works system.

EXPERIMENTAL DETERMINATION OF THE LATENT HEAT OF AMMONIA AND SULPHUR DIOXIDE.

BY D. S. JACOBUS, HOBOKEN, N. J.

These two fluids are at present the most generally used for the production of artificial cold. The author presents results of experiments to determine their latent heat, together with the description of an apparatus which has been constructed at the Stevens Institute for such experiments. The paper reviews the work of Regnault and other experimenters in the same direction, and gives several tables of comparison of results found by experiment and theoretical calculations.

PERFORMANCE OF A 75 TON REFRIGERATING MACHINE OF THE AMMONIA COMPRESSION TYPE.

BY JAMES E. DENTON.

This is a very elaborate paper of 79 pages, profusely illustrated with indicator and plotted diagrams, views of machinery, etc. It describes what is probably the most complete investigation of ammonia refrigerating machine ever made. The tests recorded are eight in number, of from 11½ to 24 hours each, under conditions varied so as to obtain maximum efficiency and to determine the influence of various changes of conditions.

MECHANICAL AND PHYSICAL PROPERTIES OF SULPHUR DIOXIDE (SO_2).

BY DE VOLSON WOOD.

In the paper of Prof. Jacobus, as above noted, experimental values of the latent heat of sulphur dioxide are given. In Prof. Wood's paper, however, the statement is made that the experimental value of the latent heat of vaporization is not known, nor the specific heat of the liquid. This apparent difference will no doubt be eliminated when the papers are finally revised after discussion. Prof. Wood has deduced some formulas for determining the values of these constants, and from them he has calculated a table of the properties of SO_2 at various temperatures from 20 degrees to plus 140 degrees Fahr. His figures for latent heat are about one and a-half per cent. less than those obtained by Ledoux, who used other formulæ, and he considers that this close agreement will inspire confidence in the figures, although they probably never will take the place of experimental values.

EDISON ON ELECTRICITY DIRECT FROM COAL.

Being asked recently by a reporter about future inventions in the electrical line, Mr. Edison replied: "Do you know, I have nothing to do with the future. My works, my thoughts, are entirely engrossed with the present. It is from the present that I must work out, or study out rather, inventions that can be easily applied to commercial advantage. I deal exclusively with the practical things of life, and never try to dream useless dreams over an invention that will never benefit any one. I am now engaged on the vital question of electricity—viz.: the way to obtain it direct without the aid of other motive power. It has been a study of mine for years, and I confess that I have not yet succeeded in making the invention. I shall never cease trying to unravel the problem.

"The man who makes this invention will solve the question of motor power. I would gladly acknowledge the greatness of any one who could do this, and hail him as the king of inventors. No selfish motives of not being first would keep me from acknowledging his greatness. No other invention would so benefit and revolutionize the world. At present we have to use coal to generate steam, and it in turn gives motor power to the dynamo, which produces electricity. Only about 15 or 19 per cent. of the energy of coal is thus used. The result is an expensive and vast waste. Tons of coal are used upon vessels on one trip to Europe, but if electricity can be generated directly from the coal, then only a few basketfuls will be necessary to carry the biggest vessel across the ocean.

"Have I succeeded in making any headway? Just a little. I can get some electricity direct from coal, but it has no force to speak of. It is not the true force I am looking for. I do not dream over it, but I confess I spend many hours working over it.

"Think of it. Electricity direct from coal. It may sound like an echo of the millennium, but I do not think so. We have succeeded in using electrical force in many and various ways. But electricity can never be the motor of the world if another power is necessary to generate it. The expense is too great, and so the original power is preferable, of course. Now, for a moment imagine the condition of things following this invention: Steam will become a thing of the past, and the greatest and cheapest motor power, electricity, will be universally used. Some idea may be gained of the superior power of the new motors by stating that it will then only require three days to go to Europe, and only two or three days will be consumed in a railroad trip to California. The factory that I run, which now consumes a great quantity of coal daily, will need only a small basketful of coal to keep it going all day. Great factories that annually burn thousands of tons of coal will be run on several tons, say two or three, or a few more per annum, saving many thousands of dollars. The cost of living, the cost of goods, the cost of nearly everything will be reduced. It will cost nothing to make ice. It will be a revolution, not to throw any one out of employment, not to ruin any industry, but to benefit mankind and civilization in general."

A Few Business "Whens."

When you would gain customers, advertise; when you would keep customers, advertise. Advertising pays if done liberally, honestly and judiciously.

When you inquire into the causes of a marked success, you will invariably find that much of it was due to ability to select and retain efficient employes.

When you hang a sign outside your place of business, it pays to have a good one. It is a permanent advertisement, and indicative of your business method to the public eye.

When you are obliged to make heavy purchases on credit, have it understood that in case you are unable to settle when due, your note will be accepted without endorsement.

When you have secured a fine location, an excellent stock and admirable fixtures, remember that the real end of business is to sell goods, not the keeping of a museum.

When a friend asks you to endorse for an amount which you could not afford to lose, let your answer depend upon your valuation of his friendship as compared with your own honor.

When you have exerted your full abilities, and success seems doubtful, train your mind to review results calmly. Be sanguine. Worry, not work, is the bane of many lives.

When you have decided on a course in business, which is satisfactory to your own mind and experience, do not allow the doubts of others to dampen your enthusiasm.

When seeking the elements of success, do not ignore bodily health. The body is the servant of the brain, and both master and menial are better for healthful recreation.

When you word an advertisement, remember that the public judges your business capacity, in a measure, by the method you use. Therefore, avoid copying other people's ideas.

When you expect an advertisement to create business, word it for business. An advertisement has no life in itself; it depends for its efficiency upon the vigor with which you endow it.—[The Office.

THE HUTCHINSON SMOKE CONSUMER.

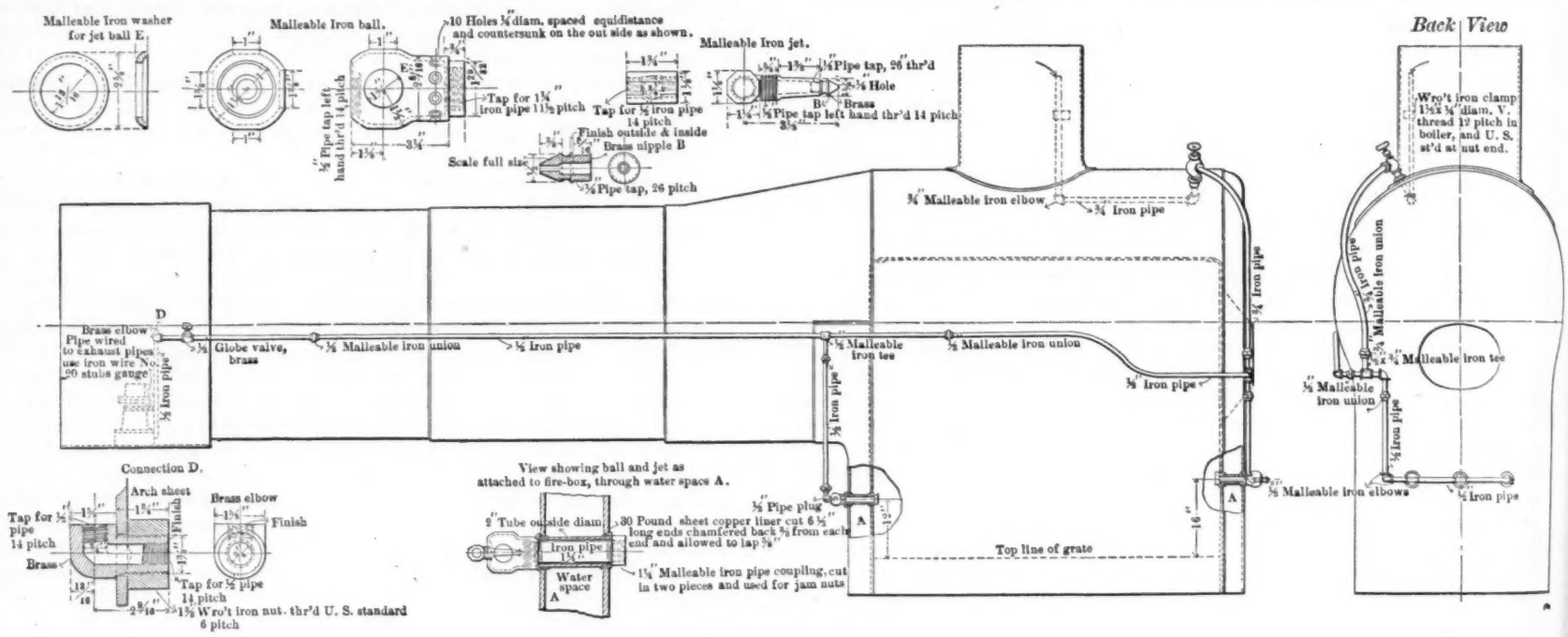
We publish on this page an illustration of the "Water Gas Furnace" for locomotives and stationary boilers, invented by Mr. W. S. Hutchinson, 525 Dearborn street, Chicago. The cut is taken from a blue print furnished by Mr. William Gilmore, master mechanic Elkhart shops of the Lake Shore & Michigan Southern railroad, which company has about 60 engines equipped. The device appears to prove the practicability of consuming smoke, and is a spark arrester as well. The inventor has just what he claims, a water gas furnace, and the simple manner in which he accomplishes the result is admirable. Water gas, like all other combustible gas, is compound of oxygen, hydrogen and carbon thrown together in proper proportions and in the right manner. The railroad companies are throwing about 20 per cent. of the fuel they buy over the patrons of the road in the form of unconsumed coal, but Mr. Hutchinson claims that it is no longer necessary that the passenger trains should run in a cloud of smoke and a shower of cinders.

It will be seen from an examination of the illustration, with its very explicit lettering, that the principle of the device is the use of a steam jet to carry air into the furnace over the fire so as to induce complete combustion. The Hutchinson smoke consumer is in use on the Lake Shore, Pennsylvania, Erie, Baltimore & Ohio, North Western, Rock Island and Western Indiana roads, and satisfactory results are reported.

How Steel is Tested.

Experience alone can enable one to detect, at a glance, hidden defects. Steel for the new vessels is subjected to surface inspection, tensile, bending, quenching, and chemical tests. For surface defects, such as pits, cracks, snakes, blisters, lamination at edges, clay-marks and evidences of over-heating or cold rolling, the inspector examines the plates after they are rolled. The first point to note is whether or not the ingot, as drawn from the reheating surface, appears too hot; he then watches the rolling and inspects the plates as they come from the rolls. Pits are detected by scale, which is dislodged with a hammer having cylindrical ends; cracks and snakes are detected without much trouble, but are sometimes covered with a thin layer of scale, and, unless this is removed, may escape notice. Occasionally a plate will be found which has a patch of sand or clay rolled in it, and spread out on the surface. This generally comes from the brick on which the ingot rests in the reheating surface.

For ship plates, four test pieces are selected to represent the heat in the tensile tests, and the inspector applies the loads himself. The cold bending and quenching tests are selected in the same manner as tensile tests. A heat or plate, which passes the required tensile tests, rarely fails on the bending tests. The pieces are bent either with a hydraulic press or under a steam hammer. Until recently the only chemical requirement for steel supplied to the navy has been a limitation of the phosphorus. This element seems to render the steel untrustworthy when present in any quantity, and it segregates largely, so giving spots in the ingots which are much richer in phosphorus than others. It is often considered by engineers and others that if the chemical composition of a particular steel is known, tensile strength can be approximately calculated. As a matter of fact, the tensile strength of rolled material depends largely upon the treatment the steel receives at the rolls. Steels of quite varying composition may be made to show the same physical characteristicts, at least as regards tensile strength, by varying the treatment at the rolls.—[New York Tribune.


Malleable Iron washer for jet ball E
Malleable Iron ball.
10 Holes ¼" diam. spaced equidistance and countersunk on the out side as shown.
Malleable Iron jet.
Tap for 1¼" iron pipe 11½ pitch
Tap for ½ iron pipe 14 pitch
Finish outside & inside
Brass nipple B
Scale full size
¾" Pipe tap, 26 pitch
¼" Pipe tap, 26" thr'd
¼" Hole
Brass
B
¾" Pipe tap left hand thr'd 14 pitch
¾" Malleable iron elbow
¾" Iron pipe
Back View
Wro't iron clamp 1¾ x ¾" diam. V. thread 12 pitch in boiler, and U. S. st'd at nut end.
¾" Malleable iron union
¾" Malleable iron tee
½" Malleable iron union
½ Iron pipe
½" Malleable iron elbows
D
Brass elbow
Pipe wired to exhaust pipes; use iron wire No. 20 stubs gauge
½ Iron pipe
½ Globe valve, brass
¾ Malleable iron union
¾ Iron pipe
½ Malleable iron tee
½ Malleable iron union
¾ Iron pipe
Top line of grate
Connection D.
Arch sheet
Brass elbow
Finish
Tap for ½" pipe 14 pitch
Brass
Tap for ½ pipe 14 pitch
1½ Wro't iron nut. thr'd U. S. standard 6 pitch
View showing ball and jet as attached to fire-box, through water space A.
½" Pipe plug
2" Tube outside diam.
30 Pound sheet copper liner cut 6½" long ends chamfered back ⅝ from each end and allowed to lap ⅝"
Iron pipe 1¾"
Water space
A
1¼" Malleable iron pipe coupling, cut in two pieces and used for jam nuts

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Tubes Instead of Plates.

The *Steamship*, Leith, Scotland, says that limit of speed capacity has been reached by use of plates, beams, etc., and suggests that light steel tubing, such as has become a marketable product at low cost, under recent improvements in gas and electric welding, may become a profitable study to the ship builder in the construction of the ship of the future. The principle of spiral welding, by which there is at once the greatest reinforcement of material, combined with lightness and tightness, accomplishes in its structural quality all that might be claimed for three times the weight in the ordinary forms of material for like purposes. The tubes not only convey the idea of lightness and strength, but that of safety, for every tube can be securely sealed as an air-tight compartment in itself, while it is acting with all its force in the construction.

PITTSBURGH NOTES.

SPECIAL CORRESPONDENCE.]

R. Monroe & Son are unusually busy on a large order for boilers for a Cincinnati firm. The order calls for boilers 20 feet long, 78 inches in diameter, and weighing over 15 tons each. The tubes are 4 inches in diameter, there being 78 tubes in each boiler.

McGill & Co. have just shipped to the Pennsylvania Steel Co., at Sparrow Point, Md., two hydraulic cylinders to be used in handling the 18-ton converters in their works. The cylinders are 16 feet 8 inches long, 13 inches in diameter, and are to be worked under a pressure of 800 pounds to the square inch.

Hillard Sterrett & Co., limited, have an improved pipe threading and cutting machine that is pronounced by those that have seen it at work to be the best now on the market. They are at work now on an order for 12 machines for one firm. The machines are made in three sizes, the largest ones cutting up to 12-inch pipe.

The Cutter Manufacturing Co., of Allegheny, will remove the hardware branch of their business to Canton, O., where they have already secured grounds and erected the buildings for a large malleable iron foundry to be run in connection with the manufacture of the hardware specialties that they already have on the market. The business will be run as the Canton Malleable Iron & Manufacturing Co. The plating branch of their business will be continued here under the same name as heretofore.

The Kensington Steel Works Co. has been organized for the purpose of building a steel works at a new town that has been located recently on the Allegheny river near Parnassas, about 30 miles from Pittsburgh. The company expect to manufacture open hearth steel. A chain factory and a sheet iron mill are already secured for the new town.

The engineering firm of Patterson & Patterson have been succeeded by Barbour, Gilfillan & Taylor. The office of the firm will be in the Yoder building.

One of the best manufacturing sites near Pittsburgh is offered free by Messrs. John A. Wood & Son. The land is within 18 miles of Pittsburgh, and 4 miles from McKeesport, within easy reach of the natural gas fields, in fact one of the largest gas lines in the country runs through the tract offered, and the site is on the banks of the Monongahela River, insuring good water transportation.

A. L. D.

The Largest Manufacturing Concern in Existence.

The announcement is formally made of a consolidation of the interests of the leading manufacturers of harvesting machinery, under the name of the American Harvester Co., with a capital stock of $35,000,000. The Directors of the mammoth new company will be Cyrus H. McCormick, Wm. Deering, Hon. Walter A. Wood, Lewis Miller, Col. A. L. Conger and Gen. A. S. Bushnell. The new company will employ 50,000 men and 10,000 agents, and have an output of about 150,000 machines a year. Each of the concerns will go on with its business until all the details are arranged for merging all into the one big concern. This is said by Chicago papers to be the greatest purely manufacturing corporation in the world. Nominally, the new organization starts with but six establishments, but the Chicago *Mail* says that of the remaining 14 concerns nearly all have long wanted to enter into such a combination as has now been effected, and options have been obtained upon the others. Thus the entire mower and reaper business of the country is involved in the American Harvester Co.

STEAM is thick or thin according as it is hot or cold.—[The Engineer. Is cold steam sold in "briquettes"?

INDUSTRIAL SUMMARY.

New Enterprises:—

The Tiffany Iron Works, at Tecumseh, Mich., has been incorporated with a capital of 50,000.

The Coatesville Boiler Works, at South Coatesville, Pa., have been incorporated, with a capital of $50,000.

It is stated that J. B. Northrop is corresponding with Northern parties relative to the establishment of a $500,000 locomotive works plant in Chattanooga, Tenn.

The Sequachee Agricultural Implement Works have been organized at Sequachee, Tenn. The new company have a capital stock of $100,000, and will begin pretty soon the erection of their plant.

A company has been organized at Carnegie City, Va., with W. A. Carpenter as President, and John Fitch, as General Manager, to operate a foundry and machine shop recently erected by these parties.

The Fulton Machine Co., with a capital of $33,000, has been formed at Syracuse, N. Y., for the purpose of manufacturing the Kendrick feed cutter, the Shepard pulley, and do general machine and foundry work.

The McCloud Iron & Steel Co., of Chicago, has been incorporated by S. McCloud, F. G. Holton and W. D. Crossman. The company will manufacture iron and steel articles for railway use. The amount of capital stock is $100,000.

The Richmond Standard Spike & Iron Co. has been chartered at Richmond, Va., with a capital stock of not less than $12 000 nor more than $24 000. The object of the concern is to manufacture iron and railroad supplies, spikes, etc.

At Lynchburg, Va., the Railway Automatic Signal Co. has been organized, with $100,000 capital stock, to manufacture an automatic railway signal, recently patented by Alexander Robertson. T. U. Davis, President; T. J. Ingram, Secretary.

Champaign, Ill., is soon to have a new industry in the form of a first-class foundry. Robinson & Burr are the moving spirits. The works will be 90x35 feet, two stories in height. The plant will be provided with the very latest machinery and appliances.

At Baltimore, Md., the Blondell Manufacturing Co., with a capital stock of $200,000, have been incorporated by J. M. Blondell, T. E. Hambleton, W. A. House, Jr., and others, to establish works for the manufacture of cars for electric, cable and horse lines.

The Monitor Steam Generator & Manufacturing Co. has been incorporated at Roanoke, Va., with a capital stock of $250,000. The company will manufacture steam generators. H. M. Engle, President; George M. Bain, Vice-President; H. C. Musser, Secretary and Treasurer.

The Tombigbee Iron Works Co., with a capital of $250,000, has been organized at Aberdeen, Miss., by E. M. Ivine, of Grand Haven, Mich., and others. The iron works now owned and operated by Mr. Ivine, at Grand Haven, are to be moved to Aberdeen and considerably enlarged.

The Virginia Car Works Co. has been incorporated at Buena Vista, Va., with a capital stock of $1,000,000, to erect and operate car works in that place. Col. A. S. Buford, formerly president of the Richmond & Danville Railroad Co., is president of the company, with F. H. Foster, of Glasgow, Va., as vice-president and Charles Conway, secretary.

The Richmond Sash Holders & Malleable Iron Novelties Co. has been organized at Richmond, Va., with $50,000 capital stock. The company own a patent on a sash holder, adapted to railway car windows. The plant will be erected at once. The officers are: S. W. Bowman, President; A. D. Wilkinson, Vice-President; John J. Mayer, Treasurer, and George Critchfield, Secretary.

A company with $100,000 capital stock, and of which S. G. Gilmore is President, has been organized at Luray, Va., to erect and operate machine shop, iron foundry and plow works. This town is having a healthy and vigorous growth, under the wise and prudent management of a progressive development company, that intends to make Luray an important manufacturing center.

A charter has been issued to the Triple Wire Nail Machine Co for the purpose of carrying on a general foundry and machine business. The principal office will be at Parkersburg, W. Va., and the sum of $15,000 has been subscribed to the capital stock, 10 per cent. of which has been paid in. The capital is divided into shares of $100, of which Joseph H. Cole, J. B. Hastings, James A. Wetherell, John A. Hutchinson, Camden Rathbone, T. P. Jeffrey, Okey K. Cole, John W. Dudley, F. E. King and J. W. Vandervort, all of Parkersburg, hold 15 each.

It is reported that a large manufacturing concern have recently made offers to owners of gully land lying within the Brooklyn freight belt line, which is to connect all the railroads entering Cleveland, as a site for their plant. It is understood that the price offered one owner was $1,000 per acre for 35 acres, but was refused. The company now seeks to obtain a parcel of land adjacent to the Cleveland Dryer Co.'s works. The gentlemen interested in securing the establishment for the village decline to state its name, but admit that iron will be the article used in the manufacture and that the works will be quite extensive.

Mr. W. B. Dunning, of Geneva, N. Y., has formed a stock company of $100,000 capital for the manufacture of his patent steam and hot water heaters. It will be known as the New York Central Iron Works Co. The capacity of the works will be doubled, and a large amount of new machinery put in. The manufacture of engines and boilers will continue to be the leading feature. The works are located right beside the railroad station, and cover nearly an acre of ground. Mr. Dunning remains at the head of the new organization as President, with O. J. C. Rose, Vice-President and Treasurer, and E. N. Squires, Secretary and Manager.

Enlargements, Additions, Removals, Etc.:—

At a meeting of the stockholders of the Beck & Corbitt Iron Co., St. Louis, last week, it was voted to increase the capital stock of the corporation from $160,000 to $200 000.

H. E Bonton's File Works, at Springfield, Mass., have been purchased by Noyle & McEdwards.

The Ingersoll Mining Machine Co., of Cleveland, will remove their plant to Rockford, Ill., at an early date.

The Wheeling & Elm Grove Railway Co. will soon begin the erection of machine shops at Wheeling, W. Va.

The Spring City Hardware Co., Spring City, Pa., intend to erect a building 100x50 for the manufacture of hardware.

The Estville (Va) Planing-mill Co. is reported as about to put in new machinery for the manufacture of sash, doors, blinds and furniture.

The machine shop of Atzbaugh & Berry, Iron City, Tenn., has been sold to Marsh & Hardwick, who contemplate adding to and improving the plant.

The old Staunton Iron Works property at Staunton, Va., has been purchased by William E Craig for $10,000, and will be improved and put into operation.

The Crucible Iron & Steel Works, East St. Louis, Ill., will nearly double their capacity by the erection of a new foundry 100x64 feet. The improvements will cost $100,000.

The McGuire Manufacturing Co. are adding three stories to their factory on North Sangamon street, Chicago. They manufacture street car trucks and a patent grain door for freight cars.

The Springfield Iron Co., Springfield, Ill., has recently increased its facilities for handling heavy scrap by the erection of two very powerful shears, one capable of shearing up to 2½ in. round iron, the other up to 5 in. round iron cold.

Yerkes & Finan Woodworking Machine Co. are building a new factory on Ninth and Dock streets, St. Louis. The moving of their works had become a necessity on account of their largely increased trade in woodworking machinery. The new factory will be 35x130 feet in dimension, three floors, and there is ample room for any additions which they may need to make. They expect to be in their new place in about six weeks.—[Age of Steel.

Hughes & Patterson, of Philadelphia, have commenced the erection of a new rolling mill at Beach and Vienna street, that city. The building will be 140x120 feet, and is but one of several large buildings which this firm propose to build in the near future. The plant now consists of two 9-inch finishing mills, an 18-inch puddle mill and a 20 inch plate mill, covering an area of 600x259 feet. These buildings will be demolished as the proposed improvements progress. Work will shortly begin on a new puddle mill, 160x90 feet, having five furnaces, with a total daily capacity of 60,000 pounds.

General Industrial Notes:—

The boiler factory of the D. P. Morgan Boiler Co., of Akron, O., which was gutted by fire to the total destruction of the machinery on the 2d inst., has been almost rebuilt.

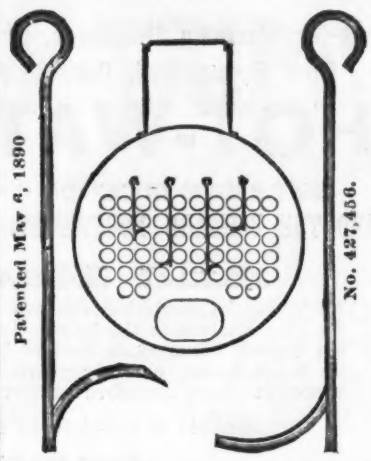
The average weekly output of the twenty-four blast furnaces in Allegheny county, including the two Edgar Thomson furnaces, has been 21 720 gross tons of 2,000 pounds, or a yearly output of 1,649 440 tons. The total output possible in the Pittsburgh district next year is 1.817 240 tons.

The average daily output of the Newcastle wire nail works is 1,200 kegs. An order was recently received for twenty-five pounds of nails ¼ of an inch long and about as thin as a fine needle. One machine was twenty hours cutting twelve pounds of the little brads, which are used for putting together strawberry boxes.—[Youngstown, (O) Telegram.

The Forsyth Scale Co.'s plant is one of the busiest industries in the city. Twenty to twenty-five men are regularly employed, and the castings, which are purchased, represent the labor of fifteen more. At present this company is engaged on a 100-ton scale for the Youngstown Steel Co., which makes its steel by the direct process. A huge pan, with a capacity for containing forty tons of molten metal, has been constructed. With the new scale, which is constructed on entirely new devised principles by the scale company, the steel company will be enabled to weigh to a pound the metal used in their castings, and the scale will prove a great advantage to them.—[Youngstown (O.) Telegram.

Wonderful Work in Steel.

The Otis Steel Co., of Cleveland, is continually surprising metal workers with wonderful performances. The company having the largest plate mill in the world, a few days ago rolled a 20-inch ingot of 8,500 pounds down to three-quarter inch plate with one heat. Some of the members of the Iron and Steel Institute, who visited these works during their tour of inspection in this country, were greatly surprised at seeing plates rolled direct from the ingots



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A scraper for the OUTSIDE of your BOILER FLUES that will remove the SCALE and SEDIMENT and keep them clean without injury to the iron. They are made to fit any size flue, and will save their price the first time used.

Price $10 a set, sent on 30 days' trial. Send outside diameter of flues.

GENTS:—I have used your Bauer's External Boiler Flue Scrapers, and find them very useful in keeping the lower tubes clean, and I would not be without them. Yours very respectfully,

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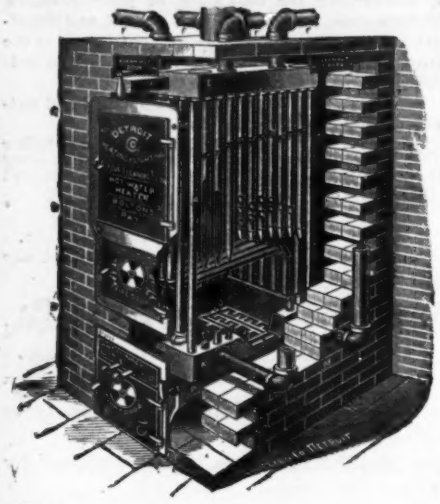
Minneapolis, Minn.

Send for circular of both the Scraper and of our Sensible Automatic Packing.

Sensible Automatic Packing Co.,
63 South Canal St., CHICAGO, ILL.

BOLTON



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Its Vertical Circulation renders its action Prompt and Rapid.
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No Bolted, Flanged or Packed Joints; therefore cannot Leak.
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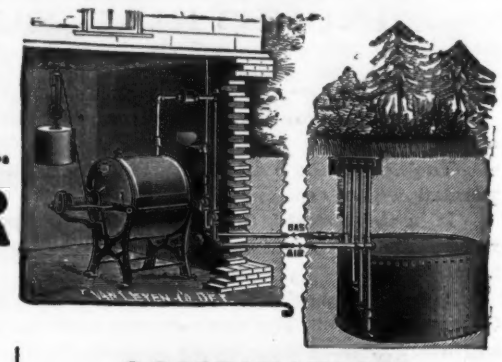

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For Country and Suburban Residences, Churches, Schools, Stores, Hotels, Etc.
Over 20 Years in use, with never an Accident.
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without being hammered, or otherwise prepared. An immense crank shaft left the Otis works last week. It is for a large stationary engine to be built by the Southwark Foundry & Machine Co., of Philadelphia, the best known builders of mill engines in this country. The shaft is 28 inches in diameter, requiring 53,000 pounds in the rough, and could not have been made by any forge in the country, as there is no hammer large enough for the purpose. These steel castings are said to be superior to any kind of steel forgings. The Otis company makes a specialty of them.—[Marine Review.

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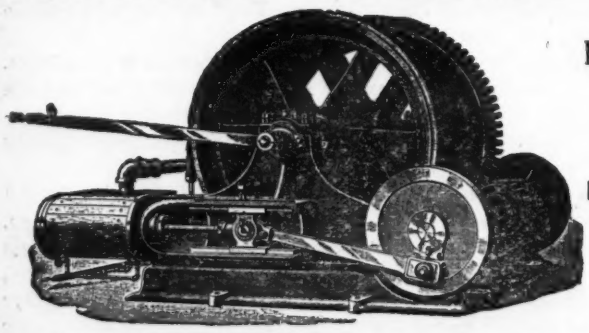

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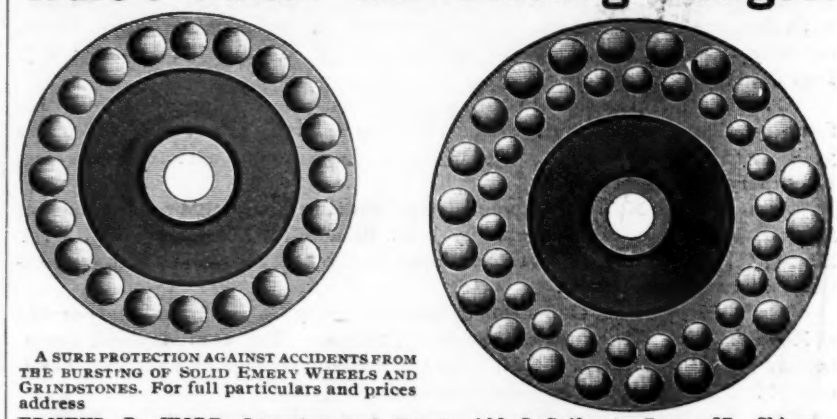

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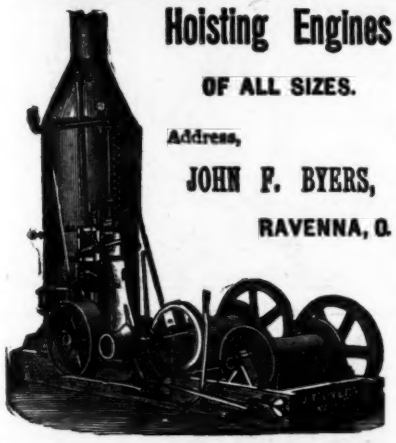

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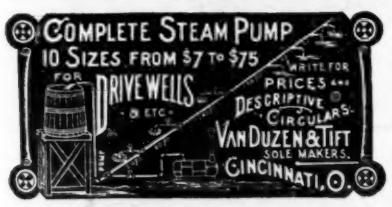
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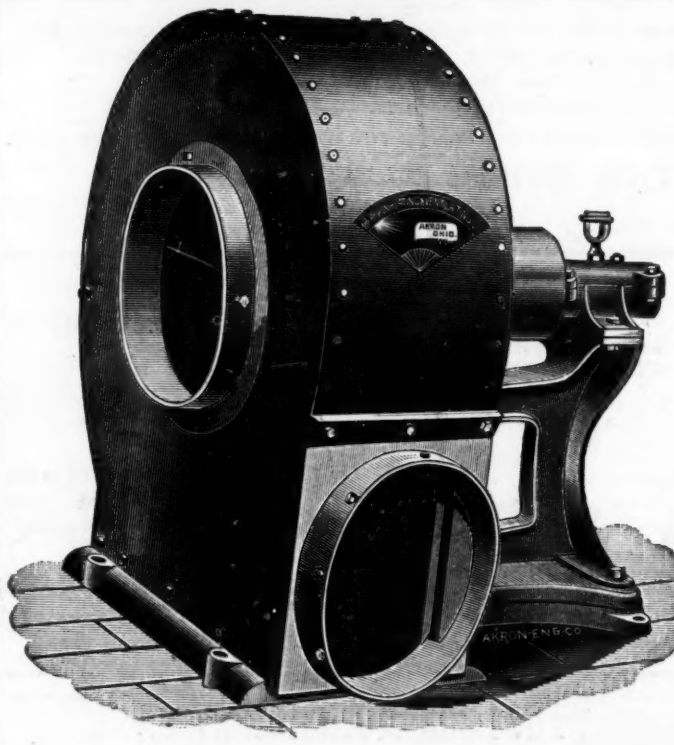

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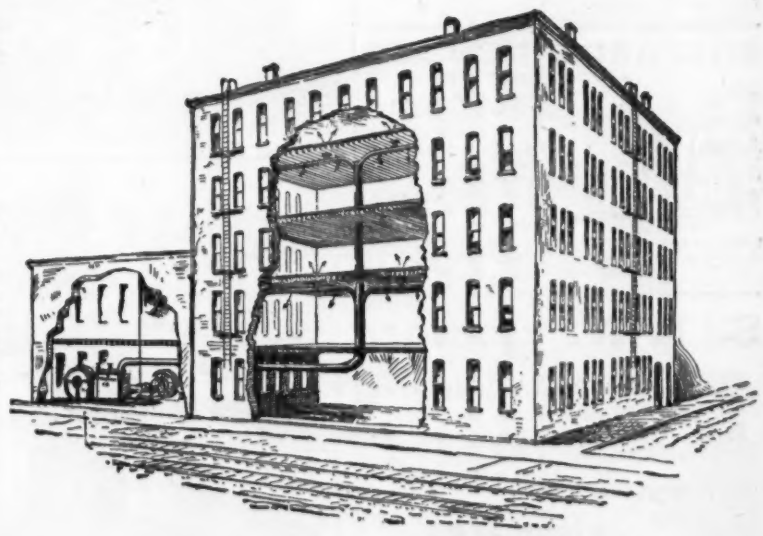

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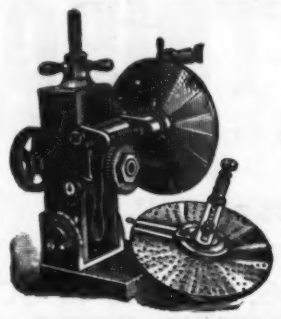

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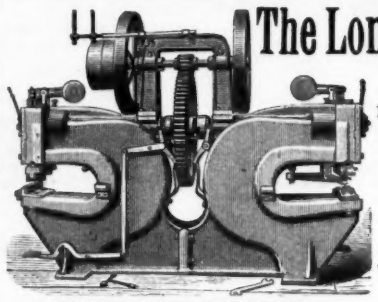

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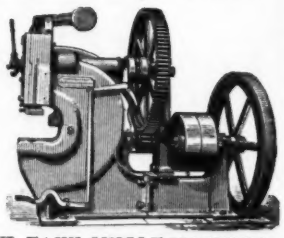

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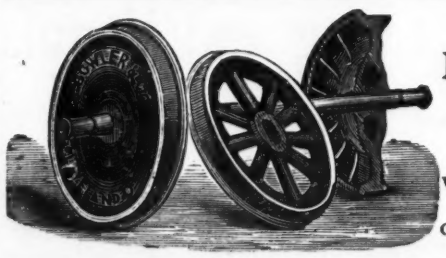

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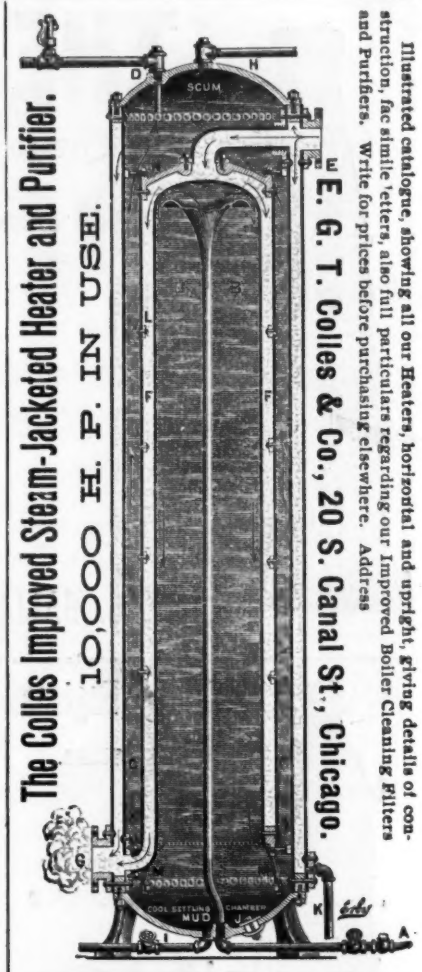

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2¾ to 3¼ inch	2 45
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⅜ to 1¼ inch	2 35
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⅝	2 75
⅝	3 15

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1¼ to 3 inch	3 05
⅜ to 1¼ inch	2 65
⅜ to ¾ inch	3 25
⅝	3 45
⅝	4 95

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1¼ to 6 by ¼ and 5-16 inch	2 15
1 to 1¾ by ¼ and 5-16 inch	2 25
¼ to ⅜ by ¼ and 5-16 inch	2 45
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1¼ to 4, Nos. 13 to 15	2 75
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1¼ to 2, No. 22	3 25
15-16, 1 and 1⅛, Nos. 13 to 15	2 95
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15-16, 1 and 1⅛, Nos. 19 and 20	3 15
15-16, 1 and 1⅛, No. 21	3 25
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⅞, Nos. 16 to 18	3 25
⅞, Nos. 19 and 20	3 35
⅞, No. 21	3 45
⅞, No. 22	3 55
13-16, Nos. 13 to 15	3 35
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11-16, Nos. 19 and 20	3 95
11-16, No. 21	4 05
11-16, No. 22	4 15
⅝, Nos. 13 to 15	3 95
⅝, Nos. 16 to 18	4 15
⅝, Nos. 19 and 20	4 25
⅝, No. 21	4 35
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1¼ to 6 by ⅛ to 3-16 in	2 35
1¼ to 6 by Nos. 11 and 12	2 45
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1 to 1¾ by Nos. 11 and 12	2 65
⅞ and 13-16 by ⅛ to 3-16 in	2 85
⅞ and 13-16 by Nos. 11 and 12	2 95
¾ and 11-16 by ⅛ to 3-16 in	3 15
¾ and 11-16 by Nos. 11 and 12	3 25
⅝ and 9-16 by ⅛ to 3-16 in	3 45
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Tank, ¼ inch and heavier	2 80
C No. 1, " "	3 05
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Above includes plates 90 inches wide.

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Machinery	base price,	3 00
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—AND—

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Corner Bank and Superior Streets,

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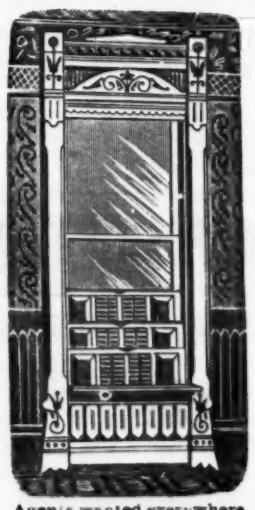

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MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 9½

Bellows.

Blacksmiths' { Hill's.....dis 40
{ Bullock's.... dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70
" " " extra.....dis 60&5
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard..dis 60&10
Shults Raw Hide Leather Belting, single.....dis 40
Shultz Raw Hide Leather Belting, double and Light Double.....dis 40
Standard, oak tanned.....dis 50@60
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 9½@10½

Chalk.

White.....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill.....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1½".....dis 50&10
Morse Taper and Straight shank Larger than 1½".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " " .....dis 55@55&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, C. F. F.	F. FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4½c	5½c		2¾c
¼ kegs ₩ lb	4¾c	5¾c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50@50c&5

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 40
ndustry File Works, hand cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15⅜	11⅜	8½	6	5½	5⅛	5
Washers	9	8	7	5	4½	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ½c., lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 { Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ¼ inch and over.....₩ lb 13¾
Sisal, ¼ inch and over.....₩ lb 13¾

Sand Paper.

B. A. & Co.....dis45@50
H. H. Barton's.....dis40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 45
" Band.....dis 20
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Cicular Saws.....dis 50
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2¾ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅛ lb Balls		21c@29c
No. 18 " " ¼ and ⅛ "		18c@28c
No. 36 " " ¼ and ⅛ "		16c@27c
2-Ply Hemp, ¼ & ⅛ lb Balls (Spring Twine)		11½c
3-Ply " 1lb Balls		12@12½c
3-Ply " 1½ lb Balls		11@11½c
Cotton Wrapping, 5 Balls to lb		15@16c

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30

Wire.

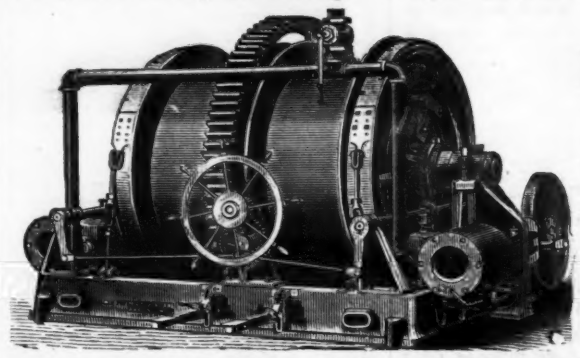
New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 5

Wrenches.

Coe's genuine, ...dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40

Webster, Camp & Lane Machine Co.



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Wire Rope Haulage Machinery,

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Ball-Norton (Monarch) Electro Magnetic Separator.

Phosphorus, sulphur, silica, hornblende and other impurities eliminated from Iron Ore, and non-Bessemer ore converted into Bessemer Ore. Samples treated without charge. Correspondence solicited.

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IRON CASTINGS.

DAILY MELTING CAPACITY 75 TONS—SPECIAL FACILITIES FOR ECONOMICALY TURNING OUT SMOOTH CLEAN CASTINGS.

DUPLICATE WORK A SPECIALTY

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VENTILATING FANS AND BLOWERS, HANGERS,

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CHAIN BELTING,

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For handling materials of all kinds.

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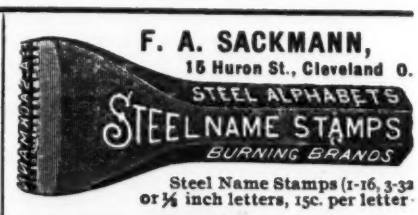

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SEND FOR CATALOGUES.

HARDWARE MARKET.

Augers and Bits.

Common augers and bits.....dis 70
Snell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₱ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₱ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $3 25@4 00
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₱ doz $8 00
Others.....₱ doz $7 00
Full polished.....₱ doz $9 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10

Sargent's list

Carriage, common, new list.....dis 70&10&7
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60
Fast joint, broad.....dis 50&10@60
Loose joint.....dis 70&5
Loose joint, jap.....dis 70&5
Loose joint, jap. with acorns.....dis 70&5
Loose pin, acorns.....dis 70&5
Loose pin, japanned acorns.....dis 70&5
Loose pin, acorns, jap. plated tips.....dis 70&5
Wrought steel—
Wrought, fast joint, narrow.....dis 70&5
Wrought, fast joint, broad.....dis 70&5
Wrought, loose joint, broad.....dis 70&5
Table Butts, back flaps, etc.....dis 70&5
Regular inside blind.....dis 70&5
Light inside blind.....dis 70&5
Loose pin.....dis 70&5
Light loose pin.....dis 70&5

Carbonized Felt and Building Papers.

(POWERVILLE BRAND.)

Eberts Bros., Detroit.	Per roll of 500 sq. feet.
No. 1—Slate s'.....	$1.25
"A," Stringed Roofing, Light.....	1.50
"B," Stringed Roofing, Medium.....	1.75
"C," Stringed Roofing, Heavy.....	2 00
Stringed, Rosin-Sized.....	1.00

MILCELLANEOUS.

Asphaltum, Trinidad Refined, ₱ ton.....$30 00
Asphaltum, Fine Grade, ₱ lb.....08
Coal Tar Felt, 1 Ply, ₱ lb.....02
Coal Tar Felt, 2 Ply, ₱ roll 108 sq ft.....1 42½
Coal Tar Felt, 3 Ply, ₱ roll 108 sq ft.....1.85
Roofing Pitch, ₱ gal.....09

Chains.

Revised List.

Trace, 6½-10-2.....₱ pair 1.03
Trace, 6½-10-3.....₱ pair .92 } .....50&10
Trace, 7-10-2.....₱ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887.....dis 50&10@60
Galvanized Pump Chain.....₱ lb 5½@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 75

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, I. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Fibre Ware—Standard.

	Nos. 1	5.	5X.
Pails, water, 12 qt.....	$4 00	$4 50	$.....
Dairy, 14 qt.....	4 50	5 00	.....
Fire 12 qt.....	5 00	...	.....
Sugar.....	6 00	6 50	.....
Horse.....	.....	5 00	.....
Buggy.....	4 00	.....	.....
Chamber, Slop, Commode 5 and 5X 14 qt.....	6 50	7 50	8 50
Jars, slop, 5 and 5X 14 qt.....	8 00	9 00	10 00

Basins, wash—	Nos. 1	5.	5X.
10½ inch.....	2 00	2 25	.....
12 inch.....	2 25	2 75	3 25
13½ inch.....	2 75	3 25	3 75
15 inch.....	3 25	3 75	4 25
Bowls, fruit.....	.....	2 50	.....
Servers, 12 in.....	.....	2 25	.....
Baskets, waste paper, 13 in.....	.....	6 00	.....
Spittons, "Daisy," pressed 8 inch.....	4 00	4 50	5 00
10 and 11¾ inch.....	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White decorated.

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₱ gross $12, dis 25@25&5

Hanger

Barn door, old patterns.....dis 60&10&10@70
Climax, (Anti-Friction).....dis 60
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 50&10
Richard's.....dis 30@30&10

Horse Nails.

No.	10	9	8	7	6	
Ausable, ₱ M..	23	24	25	26	28	dis 40
Putnam, ₱ M..	18	19	20	21	23	dis 15

Essex.....dis 25&10

Horse Shoes.

Burden, at factory.....₱ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....₱ keg $4 00
Mule Shoes, at factory.....₱ keg $5 00

Knobs.

Carriage, japanned.....₱ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hematite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbin, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 70&10
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 70
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....₱ gross $4.80

Plumbs and Levels.

Standard list.....dis 70&10
Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods.....dis 70@70&5

Pokes, Animal.

Bishop's I. X. L.....₱ doz $6 00
Bishop's O K.....₱ doz $5 25
Bishop's Pioneer.....₱ doz $3 75
Bishop's American.....₱ doz $2 75

Rakes.

Cast steel.....dis 70
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@$[illegible]...dis 10
Rifle razor.....dis $9 50 net

Rat Killers.

Schuyler's.....₱ gross $15 00

Scales.

Hatch, Counter, No. 171.....₱ doz $21 00
Hatch, Tea, No. 161.....₱ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....₱ doz $18 dis 25

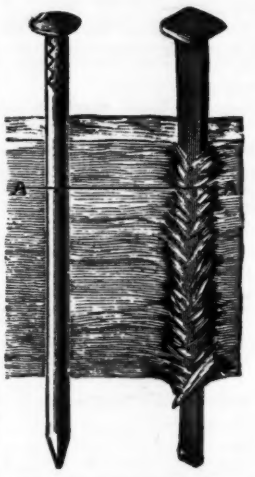
Squares.

Steel and iron, Nickel plated } dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 50&10

Tacks, Brads, Etc.

New List, Oct. 19, 1890.

American iron carpet tacks all kinds.....dis 70&10&10
Steel carpet tacks all kinds.....dis 70&10&10
Swedes iron carpet tacks, all kinds.....dis 70&10&10
Swedes iron tacks.....dis 70&10&10
Swedes iron Upholsterers' tacks..dis 70&10&10
Tinned Swedes iron tacks.....dis 70&10@10
Tinned Swedes iron Upholsterers' tacks.....dis 70&10&10
American iron cut tacks.....dis 67½&10&10
Copper tacks.....dis 50
Copper finishing and trunk nails.....dis 50&00
Cigar box nails.....dis 45&10
Finishing nails.....dis 6
Hungarian nails and miners' tacks.dis 63½&5
Gimp and lace tacks.....dis 70&5
" " " tinned.....dis 66&10
Trunk and clout nails.....dis 66⅔
Tinned trunk&clout nails.....dis 66&10&10
Basket nails.....dis 66&10&10
Chair nails.....dis 66&10&10
Common and patent brads.....dis 66&10&10



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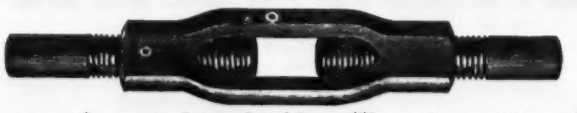

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PAGE.

Aluminum—
Cowles Electric Smelting & Aluminum Co., Cleveland..... 16

Bath Tubs—
‡Instantaneous Water Heating Co., Chicago, Ill..... 18

Bolts and Bolt Machinery—
Upson Nut Co., Cleveland..... 16

Bolt Holders—
*W. R. Santley & Co., Wellington, O..... —

Boilers and Boiler Attachments—
Babcock & Wilcox Co., New York..... 20
Wm. B. Pollock & Co., Youngstown, O..... 19
The Hazelton Tripod Boiler Co., Chicago. 11

Blowers—
W. H. LaFountaine, Cleveland, O..... 14

Camp Stools—
Acme Manufacturing Co., Springfield, O.. 11

Coal and Coke—
Pittsburgh & Wheeling Coal Co., Cleveland..... 13

Cornice Work—
W. H. Mullins, Salem, O..... 10

Cranes and Derricks—
Wm. Tod & Co., Youngstown, O..... 18

Car Wheels—
Bowler & Co., Cleveland..... 12

Chain Belting—
Jeffrey Mfg. Co., Columbus, O..... 14

Carpet Cleaning & Laundry Machines—
W. H. LaFountaine, Cleveland, O..... 14

Damper Regulators—
*Curtis Regulator Co., Boston, Mass..... 18

Die Makers.
Avery Stamping Co., Cleveland..... 12

Drilling Machines—
Universal Radial Drill Co., Cincinnati, O.. 12

Elevators—
L. S. Graves & Co., Rochester, N. Y..... 15

Explosives—
Hercules Powder Co., Cleveland..... 18

Electrical Manufactures—
†Cleveland Electrical Mfg. Co., Cleveland —
Brush Electric Co., Cleveland..... 12

Elevator Buckets.
Avery Stamping Co., Cleveland..... 16

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill..... 20

Emery Wheel Flanges—
*Edmund R. Ware, Chicago, Ill..... 10

Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland..... 17
Union Electrotype Foundry, Cleveland.... 16

Engines (Steam)
*Chandler & Taylor Co., Indianapolis, Ind. 12
Jas. Leffel & Co., Springfield, O..... 18
Wm Tod & Co., Youngstown, O..... 18
Skinner Engine Co., Erie, Pa..... 18
Aetna Machine Co., Warren, O..... 18
C. H. Presley, Cleveland..... 12

Engines (Gas)—
Schleicher, Schumm & Co., Philadelphia, Pa. and Chicago, Ill..... 19
Van Duzen Gas Engine Co., Cincinnati, O..... 17

Engines (Hoisting)—
John F. Byers, Ravenna, O..... 11

Engines (Oil)
C. H. Presley, Cleveland, O..... 12

Engineers' Specialties—
*Curtis Regulator Co., Boston, Mass..... 18
Sensible Packing Co., Chicago, Ill 10

Ejectors—
James Jenks, Detroit, Mich..... 12

Flue Cleaners—
†Butman Furnace Co., Chicago, Ill..... —

Files, Makers of—
Reynolds Bros., Columbus, O..... 20
A. & H. Gough, Cleveland..... 12
Parkin & Bosworth Co., Cleveland..... 20

Forges—
Cleveland City Forge & Iron Co., Cleveland 20

For Sale—
Foundries, Furnaces, Machinery, etc..... 16

Foundries—
Bowler & Co., Cleveland..... 12 & 16
Thos. D. West. Foundry Co., Cleveland..... 14

Foundry Cupolas—
Victor Collian, Detroit, Mich..... 12

Frost Proof Steam Traps—
*Curtis Regulator Co., Boston, Mass..... 18

Furnace Feeders—
Brightman Stoker Co., Cleveland..... 18

Galvanizers.
Avery Stamping Co., Cleveland..... 12

Gas Machines—
Detroit Heating & Lighting Co., Detroit, Mich..... 10

Gear Cutters—
Palmer, Cunningham & Co., Philadelphia, Pa..... 12

Galvanized Iron—
*Cincinnati Corrugating Co., Piqua, O..... 10

Gum Roofing—
Gum Elrstic Roofing Co., New York N Y. 19

Heating and Ventilating Apparatus—
*Akron Heating & Ventilating Co., Akron, O..... 11
W. H. LaFountaine, Cleveland, O..... 14

Hose—
Fabric Fire Hose Co., New York..... 19

Heaters and Purifiers—
Stilwell & Bierce Manufacturing Co., Dayton, O..... 28
Laidlaw & Dunn Co., Cincinnati, O..... 12
E. G. T. Colles & Co., Chicago..... 12

Hangers—
W. H. LaFountaine, Cleveland, O..... 14

Injectors—
Columbia Injector Co., Cleveland..... 12
Penberthy Injector Co., Detroit, Mich..... 20

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O... 19
Cambridge Iron Roofing Co., Cambridge, Ohio..... 19
Garry Iron Roofing Co., Cleveland..... 19
Standard Iron Co., Bridgeport, O..... 19
Thompson Manufacturing Co., Cleveland, 19
Berger Mfg. Co., Canton, O..... 19
Holton Iron Roofing Co., New Lisbon, O 19
Eberts Bros., Detroit, Mich..... 20

Iron Ore, Bar and Pig Iron—
Dalliba, Corrigan & Co., Cleveland..... 13
Oglebay, Norton & Co., Cleveland..... 13
J. H. Outhwaite & Co., Cleveland..... 13
Condit-Fuller Co., Cleveland, O..... 13
Pickands, Mather & Co., Cleveland....13 & 16
H. N. Hill & Co., Cleveland..... 13
E. C. Pope, Cleveland..... 13
Cleveland Iron Mining Co., Cleveland..... 13

Lathes—
H. L. Shepard, Cincinnati, O..... 12

Manufacturing Sites—
Chas. G. Eddy, Norfolk, Va..... 17
John A. Wood & Son, Pittsburgh, Pa..... 16

Mining Machinery—
Webster, Camp & Lane Machine Co., Akron, O..... 14
*Copeland & Bacon, New York..... 10

Machine Shops—
Webster, Camp, & Lane Machine Co., Akron, O..... 16

Machinists' Tools and Supplies—
Parkin & Bosworth, Cleveland.....16 & 20
Garvin Machine Co., New York..... 12
C. H. Presley, Cleveland, O..... 12

Oil Fuel Process—
Aerated Fuel Co., Springfield Mass.....15

Ore Separators—
H. E. Collins & Co., Pittsburgh, Pa..... 14

Patents—
Wm. M. Monroe, Cleveland..... 14
*Thos P. Simpson, Washington, D. C..... —

Patterns—
Gobeille Pattern Co., Cleveland, O..... 15

Pumps (Steam)—
Laidlaw & Dunn Co., Cincinnati, O..... 18
Rumsey & Co., Seneca Falls, N. Y..... 18
Van Duzen & Tift, Cincinnati, O..... 11

Printing Inks—
Ault & Wiborg, Cincinnati, O..... 11

Paint—
Iron Clad Paint Co., Cleveland, O..... 12
Akron Chemical Co, Akron O..... 11

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill..... 19

Pulleys—
Ohio Pulley & Machine Co., Warren, O.... 11

Pipe Cutting & Threading Machines—
*Wells Machine Works, Fostoria, O..... —

Packing—
Sensible Packing Co., Chicago, Ill..... 9

Pipe Fittings—
Isaac B. Potts Pipe Fitings Co. Columbus, O..... 19

Punches and Shears—
Long & Allstatter Co., Hamilton, O..... 12

Rolls and Pinions—
Totten & Hogg Iron & Steel Foundry Co., Pittsburgh, Pa..... 20

Railroads—
Time Tables, Etc..... 17

Railway Supplies—
Bowler & Co., Cleveland..... 12
Cleveland City Forge & Iron Co., Cleveland..... 20

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland..... 13

Saws—
Peter Gerlach & Co., Cleveland..... 11

Saw Mills—
*Enterprise Mfg. Co., Columbiana, O..... —

Shafting—
Fitzsimons & Co., Cleveland..... 20
*Brightman Machine Co,, Cleveland..... —

Shapers—
*J. Steptoe & Co., Cincinnati, O..... 20

Second-Hand Machinery—
D. K. Norton & Son., Cincinnati, O..... 16

Steam Heating Apparatus—
*Curtis Regulator Co., Boston, Mass..... 18
Detroit Heating & Lighting Co., Detroit, Mich..... 10

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn..... 12

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland..... 16
F. A. Sackman, Cleveland, O..... 14

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland..... 3
Cambridge Iron & Steel Co., Cambridge, O 13

Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa..... 19

Sheet Steel—
Standard Iron Co., Bridgeport, O..... 19
Cambridge Iron & Steel Co., Cambridge, O 13

Stampers of Sheet Metal—
Avery Stamping Co., Cleveland..... 12

Stokers—
Brightman Stoker Co., Cleveland..... 18

Stove Pipe Crimpers—
Acme Manufacturing Co., Springfield, O.. 11

Tinning Steel, Etc.
Avery Stamping Co., Cleveland..... 12

Twist Drills—
Cleveland Twist Drill Co., Cleveland..... 20

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland..... 20
Central Iron & Steel Co., Brasil, Ind..... 15

Tackle Blocks—
Fulton Iron & Engine Works, Detroit, Mich..... 20

Water Gas Furnaces—
W. S. Hutchinson, Chicago, Ill..... 20

Window Blinds—
Hartman & Durstine, Wooster, O..... 13

Wire Goods—
*F. Powell & Co., Toledo, O..... 20

Wire Machinery—
John Adt & Son, New Haven, Conn..... 12

Wire Nails—
Salem Wire Nail Co., Salem O..... 15

Wood-Working Machinery—
Indiana Machine Work, Ft. Wayne, Ind 17 11
Egan & Co., Cincinnati, O..... 19
G. H. Scanlan & Co., Portland, Me..... 16
*Battle Creek Machinery Co., Battle Creek, Mich..... —

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33	60 to 70 h. p. Horizontal Side Crank	400
49	50 to 60 h. p. Horizontal	400
81	10 to 12 h. p. Side Crank	100
104	150 to 200 h. p. Horizontal Variable Cut-off	700
130	25 h. p. Horizontal Side Crank	200
142	50 h. p. Balanced Horizontal Side Crank.	350
144	30 h. p. Horizontal	300
171	5 h. p. Vertical Center Crank	70
178	16 h. p. Horizontal	190
184	60 h. p. Balanced Side Crank	400
88	14 h. p. Self Contained Side Crank	125
197	10 h. p. Balanced Side Crank	100
202	20 h. p. Center Crank	240
207	20 h. p. Center Crank	240
208	20 h. p. Center Crank	240
209	12 h. p. Center Crank	160
210	16 h. p. Center Crank	200
211	16 h. p. Center Crank	200
203	20 h. p. Center Crank	240
204	20 h. p. Center Crank	240
205	20 h. p. Center Crank	240
206	20 h. p. Center Crank	240

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77	8 h. p. Tubular	100
103	75 h. p. Tubular	450
123	35 h. p. Tubular, 2-flue	225
149	25 h. p. Tubular	275
175 & 176	2 75 h. p. Steel Horizontal Tubular, each	550
170	75 h. p. Horizontal, 6-flue	325
183	40 h. p. Horizontal Tubular	350
199	30 h. p. Horizontal Steel Tubular	300

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192	16 h. p. Portable on High Wheels	500
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114	25 h. p. Portable Engine and Boiler, skids	400
135	25 h. p. Portable Engine and Boiler, "	500
154	10 h. p. Portable Engine and Boiler, "	300
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48	10 h. p. Portable Fire Box, skids		150
133	18 h. p. Fire Box,	"	225
153	25 h. p. Fire Box,	"	300
191	10 h. p. Fire Box,	"	140
200	20 h. p. Fire Box,	wheels	275
6	35 h. p. Fire Box,	skids	300
78	15 h. p. Fire Box,	"	225
83	60 h. p. Fire Box,	"	500
48	10 h. p. Fire Box,	"	140
113	18 h. p. Fire Box,	"	175
101	25 h. p. Fire Box,	"	300
116	16 h. p. Portable,	"	225
165	12 h. p. Fire Box,	"	160

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25	15 h. p. Single Flue	100
138	10 h. p. Single Flue	100
134	15 h. p. Steel Vertical Submerged Tube	175

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J. & S. Graham Single Surfacer and Matcher.	400
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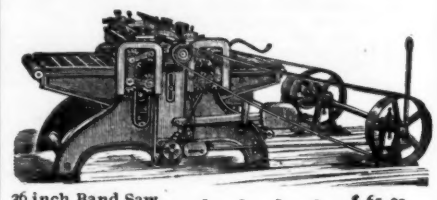

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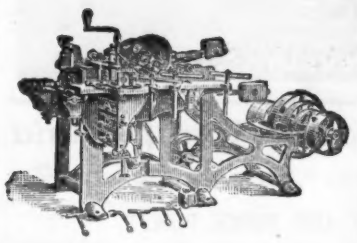

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Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express.....	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo.....		†6 40 a m
Pittsburgh Express.....	†6 25 p m	
Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	†1 20 p m	11 10 p m
New York Express.....	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m.,6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.
Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 25 a m	*6 30 p m
Marietta Express.....	*11 15 a m	*2 45 p m
Bal'o. & Wash. Express....	*4 30 p m	*10 25 a m
Cleve. and Canton Express	†6 30 p m	†8 15 a m

*Daily. †Daily, except Sunday.

J. T. JOHNSON, Gen. Supt. J. B. CAVEN, Gen. Pass. Agt.

From Cleveland Union Station.

PENNSYLVANIA LINES.

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	7 45 a m	d5 25 a m
	1 15 p m	12 50 p m
	d11 10 p m	6 35 p m
Wheeling and Bellaire.	7 45 a m	12 50 p m
	1 15 p m	6 35 p m
	*11 10 p m	.....
Alliance Accom.....	3 25 p m	10 10 a m
Ravenna Accom.....	5 00 p m	8 25 a m

d Daily. * Except Saturday. Other trains except Sunday.

From Cleveland Union Station.

Mt Vernon and Pan Handle Route

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus. Xenia, Dayton, Cincinnati. Louisville, Indianapolis, St. Louis, and all points in the South and Southwest.	8 00 a m	d 7 00 am
	d 8 00 p m	5 40 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus.	1 15 p m	12 50 p m
For Cuyahoga Falls, Akron, Orrville, Chicago, and all points in the West and Northwest.	8 00 a m	5 40 p m
	3 25 p m	10 10 a m

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Pullman Palace Sleeping Cars daily between Cleveland, Columbus and Cincinnati. City ticket office, Weddell House corner.

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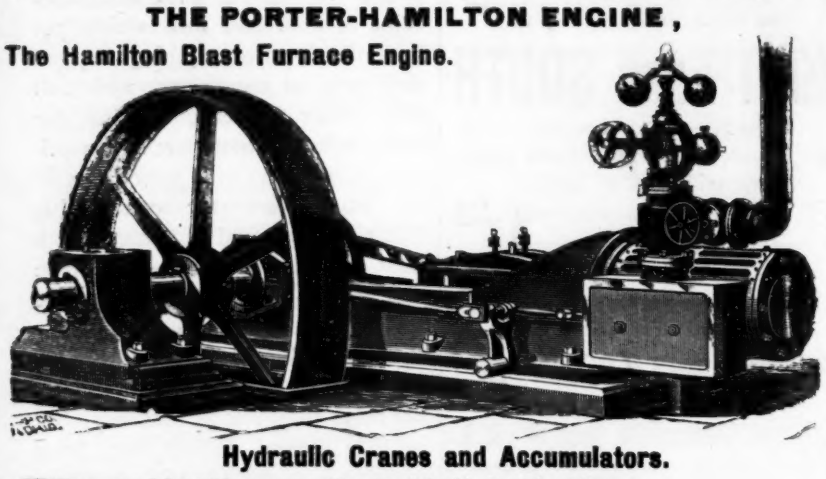
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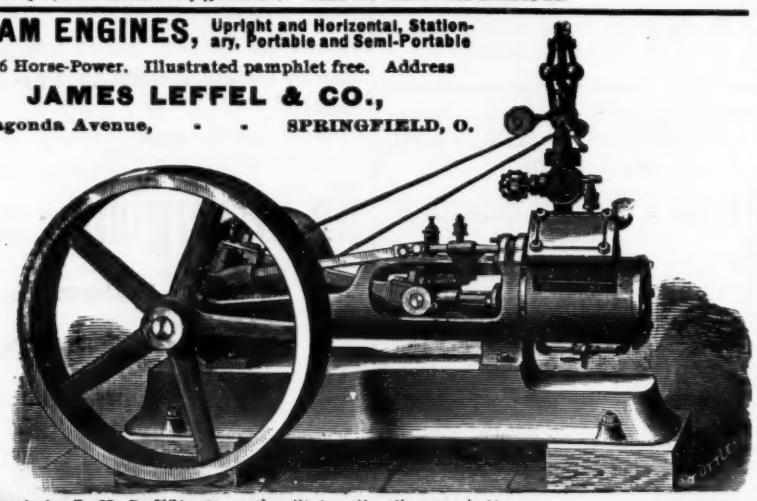
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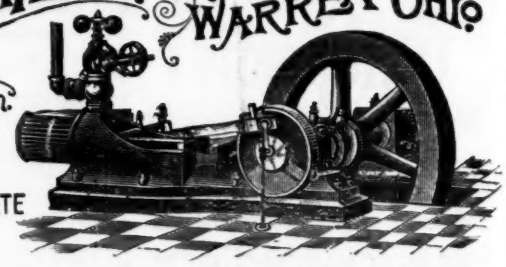

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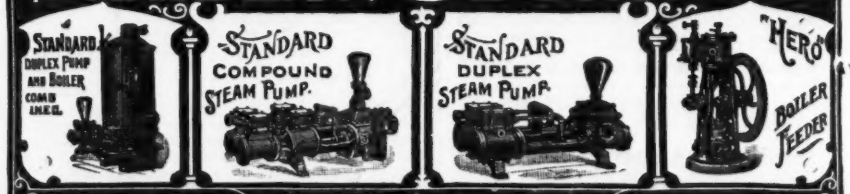

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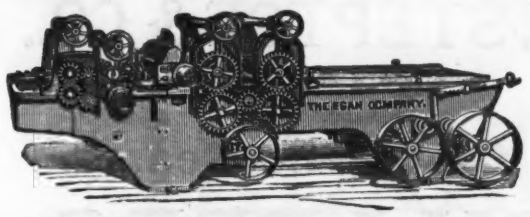

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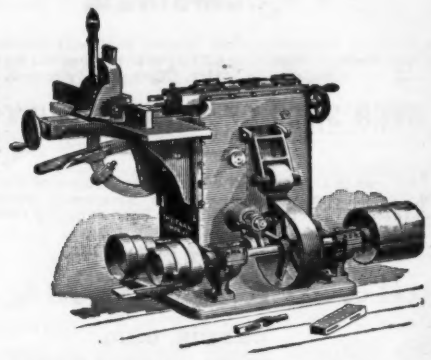

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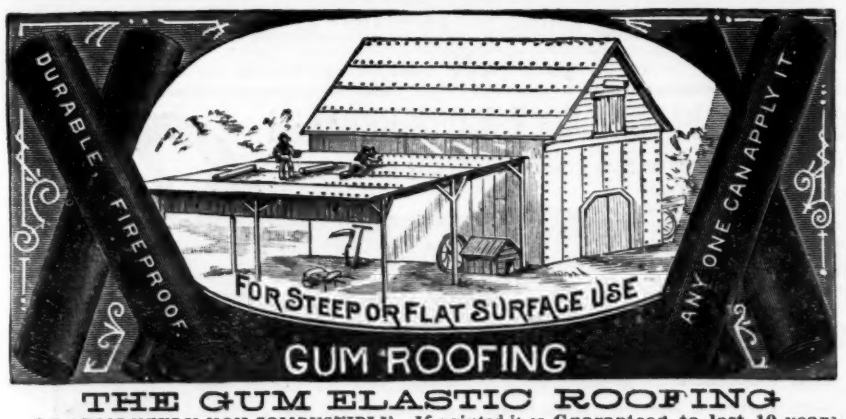

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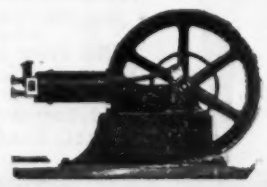

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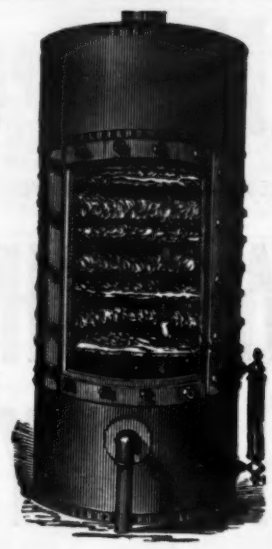

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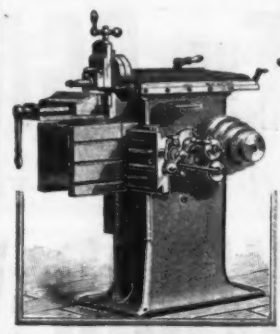

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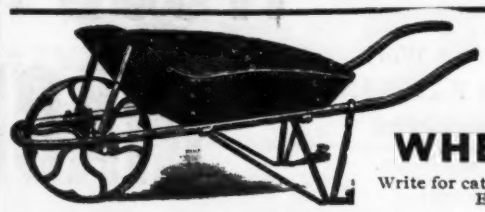

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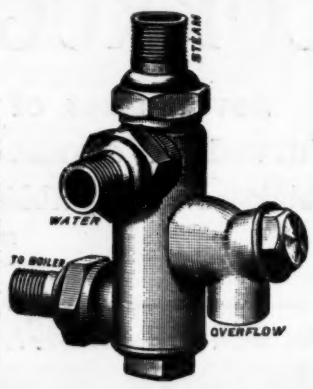

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